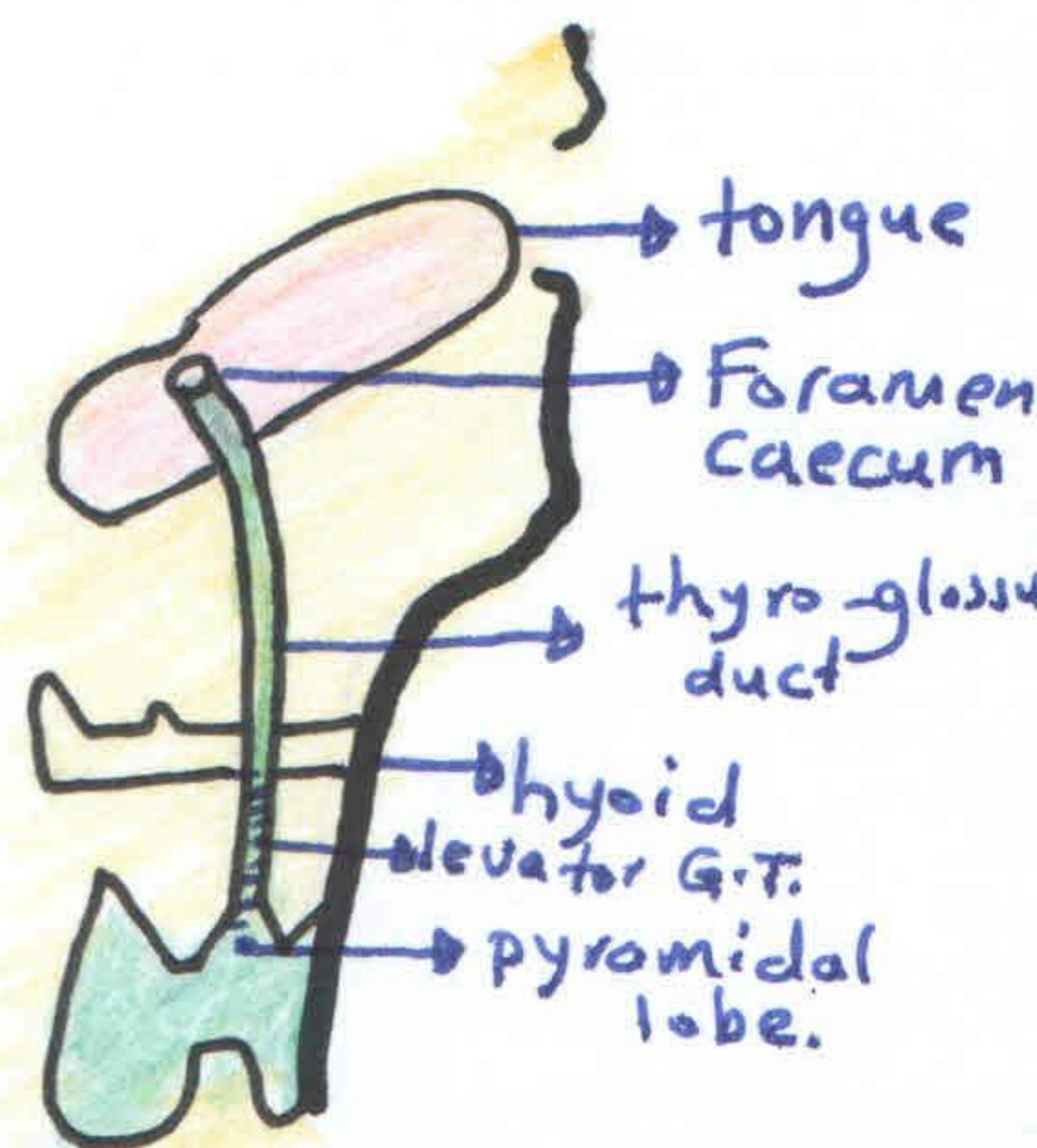


①

Thyroid Gland

* EMBRYOLOGY :

The thyroid gland develops as a diverticulum in the floor of pharynx at 3rd week, then descends in the neck in front of hyoid bone during descend it is joined by para follicular C-cells from neural crest.



When the gland reaches its position the duct between it & tongue (thyroglossal duct) is closed & disappear leaving a foramen at junction between ant. 2/3 & post 1/3 of tongue [foramen caecum] and the remnant of duct between hyoid bone & pyramidal lobe of the gland is called (levator glandulae thyroidea)

* Congenital anomalies :

① agenesis

② Lingual thyroid.

③ incomplete descend.

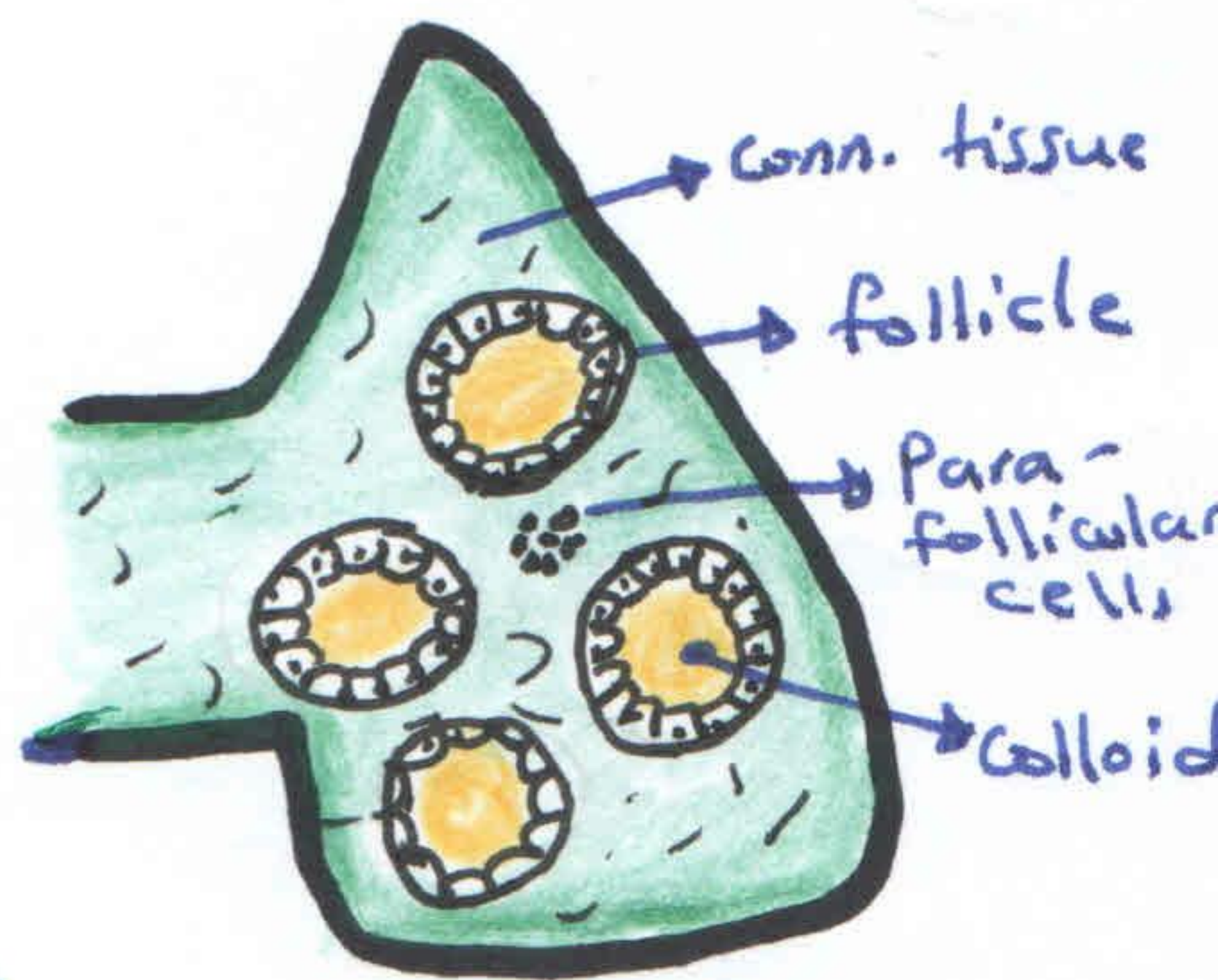
④ Retrosternal gland.

⑤ thyroglossal cyst. (commonst)

* HISTOLOGY :

The gland is formed of acini (follicles) (25-40) which is lined by cubical (or columnar) cells & filled with colloid substance.

Between the follicle is the connective tissue which contains para follicular "C" cells



VISIT...

LANZAROTE
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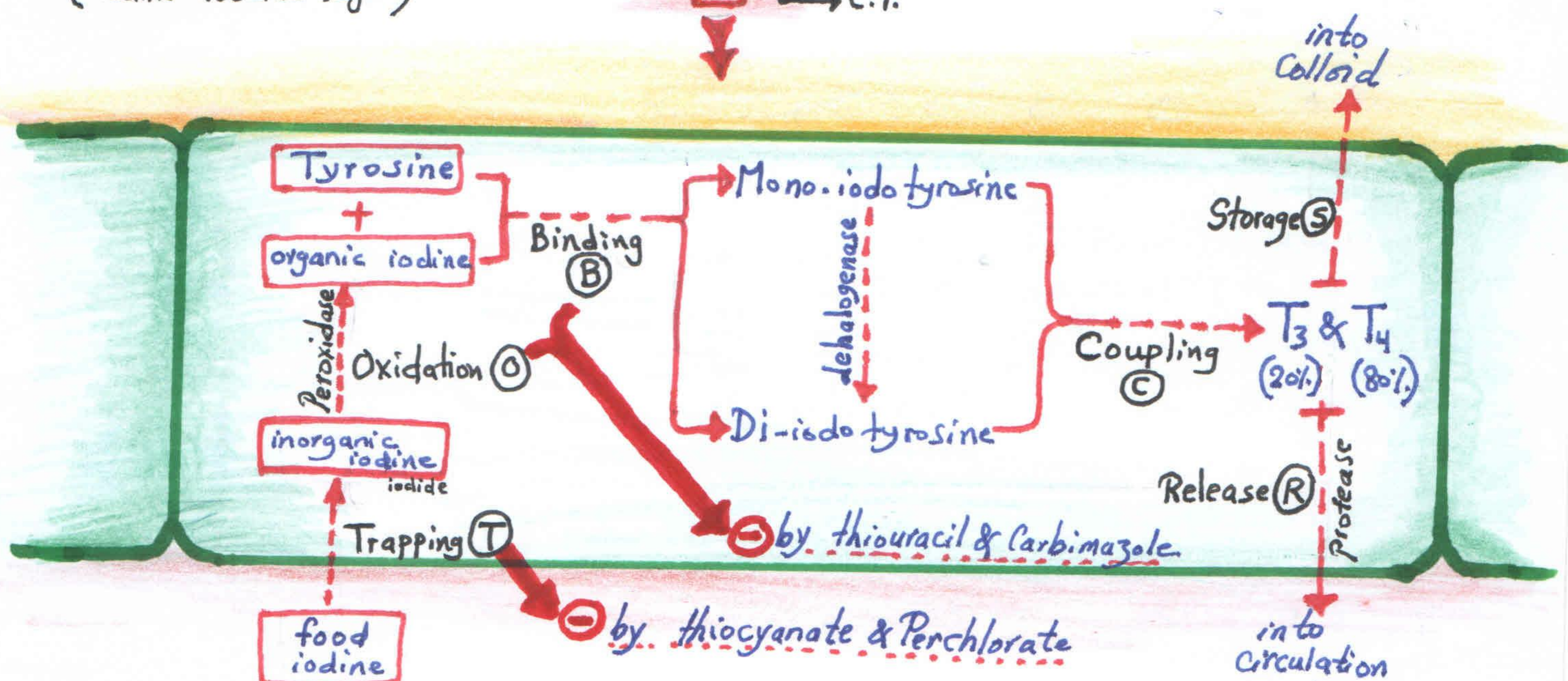
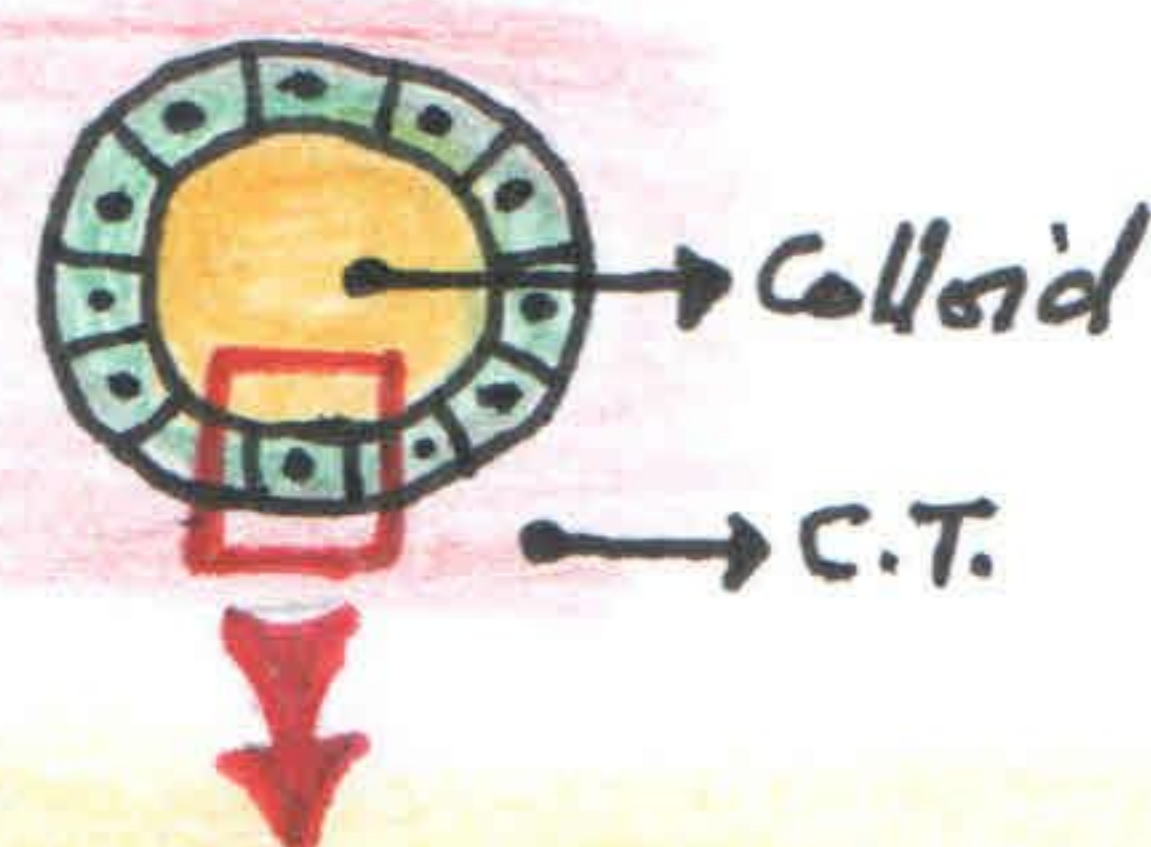
*PHYSIOLOGY:

The gland secretes T_3 , T_4 & thyrocalcitonin. [T_4 = thyroxine]

The effect of these hormones are:

- ① Catabolic effect ($\uparrow$ Lipolysis - $\uparrow$ proteolysis - $\uparrow$ Glycogenolysis).
- ② Metabolic effect ($\uparrow$ BMR & energy liberation) ie Thermogenic hormones.
- ③ Increase (stimulate) $\rightarrow$ skeletal, sexual & mental growth.
- ④ Increase sensitivity of (α & β receptors) to catecholamin (e.g adrenaline) which $\rightarrow$ ($\uparrow$ HR, tremor & sweating).
- ⑤ Decrease serum cholesterol level.
- ⑥ Decrease serum Calcium level (by calcitonin) (opposite to PTH).

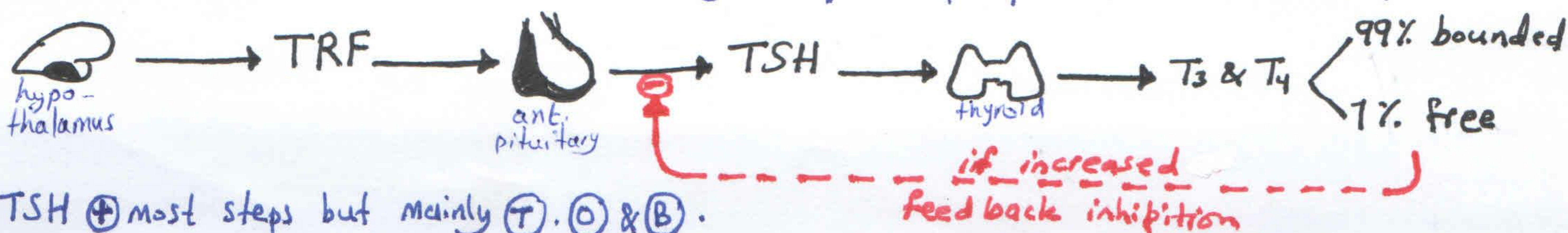
(Daily requirement of iodine 100-125 μ g.)



The released T_3 & T_4 bound to protein (thyroxine binding protein TBG)

but $\approx 1\%$ remains free & can affect at TSH ($\uparrow T_3, T_4 \rightarrow \downarrow TSH$)

T_4 (inactive) is transferred to T_3 (active) in peripheral circulation



TSH $\oplus$ most steps but mainly (T), (O) & (B).

$\uparrow$ Iodide supply inhibit iodide organification (Wolff-Chaikoff effect) $\rightarrow \downarrow T_3, T_4$ synthesis

* ANATOMY :-

• Description :-

- The gland consists of 2 lobes connected by isthmus with pyramidal lobe above it., weighs (20-25 gram).
- Each lobe is pyramidal with apex reaching oblique line of the thyroid cartilage & base upto 5th or 6th tracheal rings.
- The isthmus lies opposite 2nd, 3rd & 4th rings.
- The gland is covered by True (fibrous) capsule & False (facial) capsule the facial capsule (pretracheal fascia) is attached above to oblique line of thyroid cartilage which → movement of thyroid gland during deglutition & between the 2 capsules lies the vessels.

• Relation :-

- Medial :- Trachea, Larynx, Oesophagus, pharynx, recurrent & ext. laryngeal N.
- Posterior :- Parathyroid glands & carotid sheath with its contents.
- Lateral :- skin & fascia containing platysma muscle
 - Omohyoid, sternohyoid, sternothyroid & sternomastoid.

• Arterial supply :-

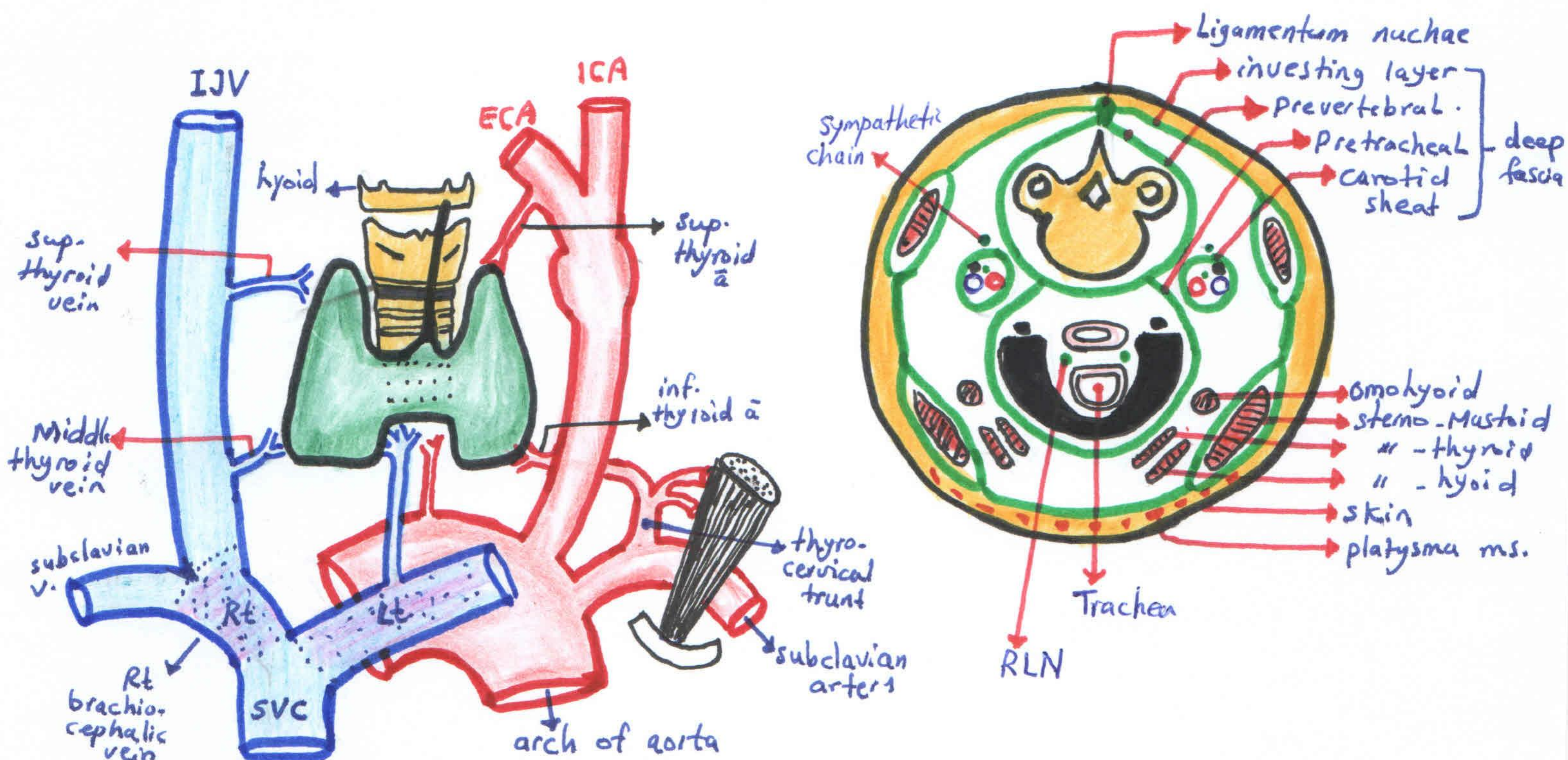
- ① Superior thyroid a :- branch of ext. carotid a & related to ext. laryngeal nerve (NB - Ligation of a near upper pole to avoid N. injury)
- ② inferior thyroid a :- br. of thyrocervical trunk (of 1st part subclavian a) related to RLN (Ligation of a away from lower pole to avoid N. injury)
- ③ Thyroidae ima a :- br. of arch of aorta (occasionally present).
in 30%.

• Venous drainage :-

- ① superior thyroid v :- (paired) → drain into internal jugular vein
- ② Middle " " (paired) → " " " " "
- ③ inferior " " (usually single) → " " left brachiocephalic (innominate).

Lymphatic drainage

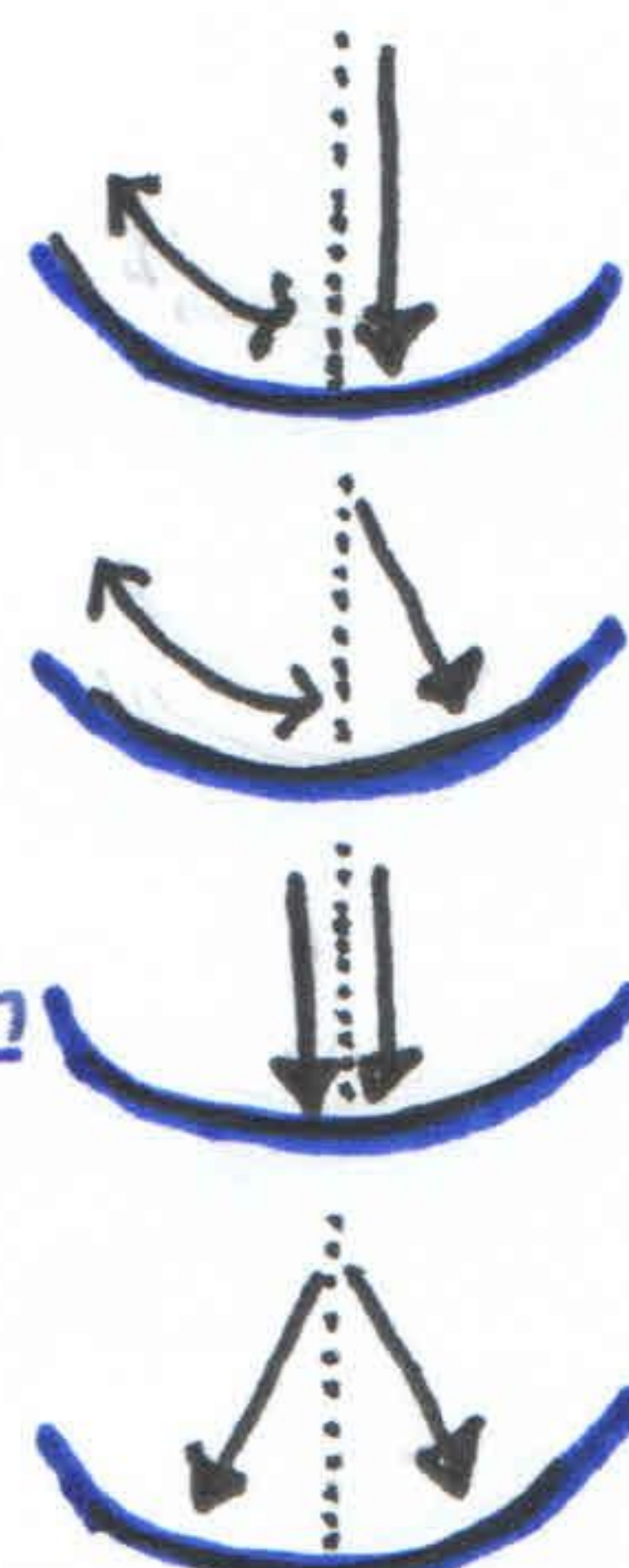
→ into pretracheal, prelaryngeal LN & → deep cervical LN.
 ↳ Dorsal LN.



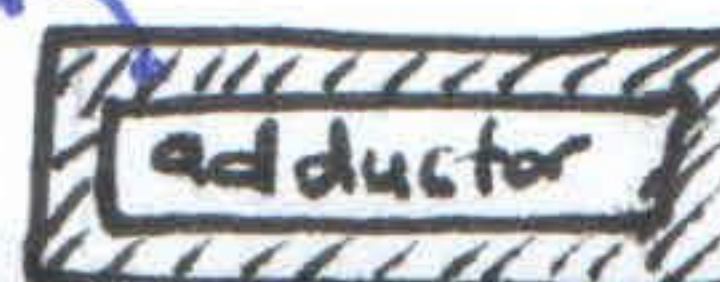
[NB] The recurrent Laryngeal N. (RLN) supplies all ms. of larynx except Cricothyroid which is supplied by ext. laryngeal N. (ELN)

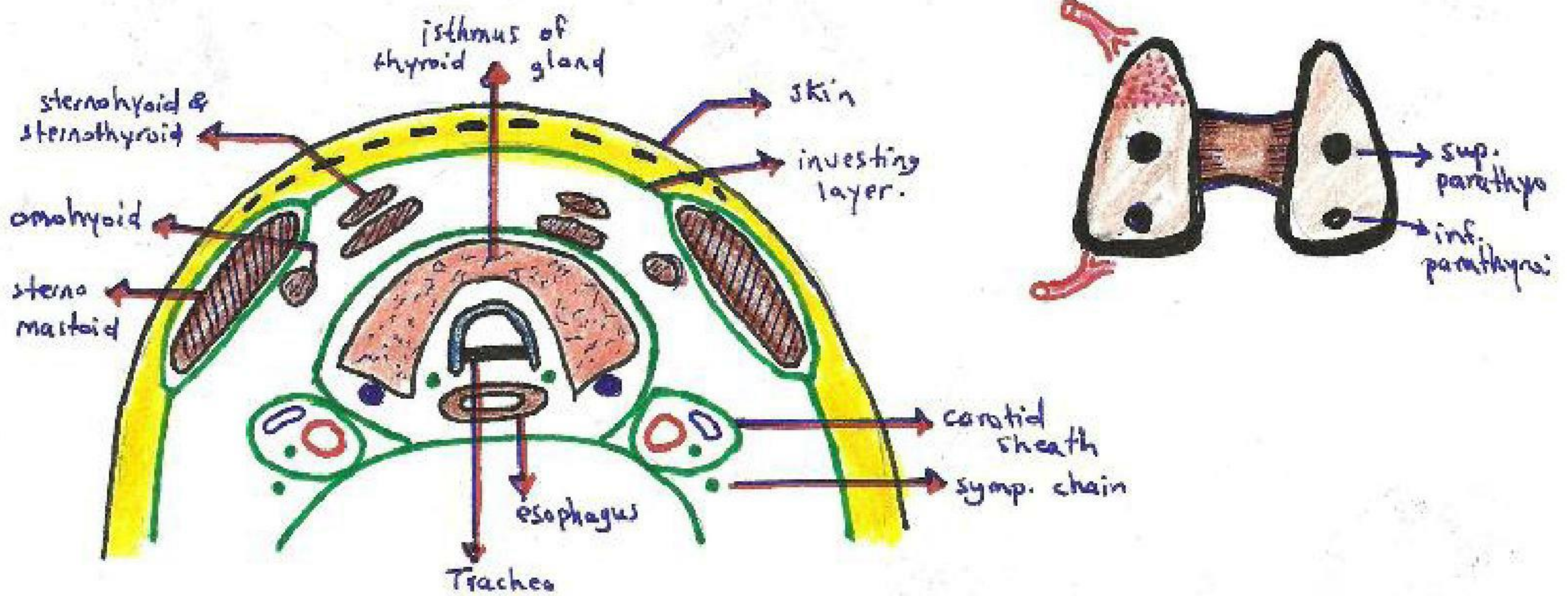
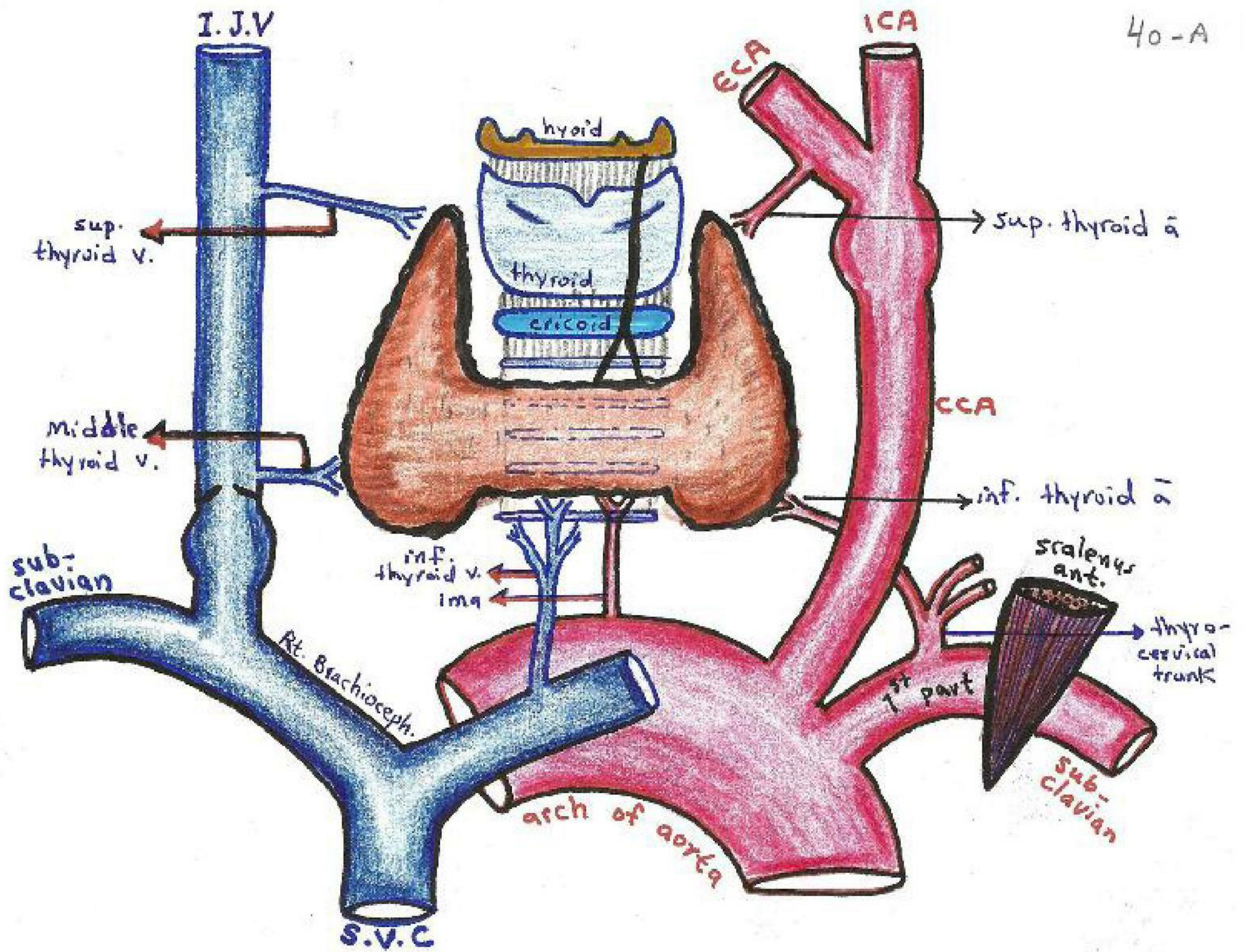
ELN injury — Unilateral → Loss of high pitched voice.
 — Bilateral → Choking.

RLN injury — Unilateral — Partial → dysnea on exertion
 — Complete → hoarseness of voice
 — Bilateral — Partial → stridor & suffocation
 — Complete → Aphonia



— this is bec. the outer fibers of RLN supplies abductor muscles while inner one supplies adductor ms. → so partial injury → only adductor acting → cord in midline (adduction) while complete injury → add. & abductor paralysed → midway position (= cadaveric position)





THYROID & PARATHYROID

5

THYROGLOSSAL CYST

- It is a remnant of thyroglossal duct. (congenital anomaly). usually ^{commonest cong. anomaly in neck swelling} present in the midline anywhere from tongue to thyroid gland (but commonly just below hyoid bone).

• Clinical picture :-

- Common at childhood, presents as disfigurement (mass in midline) & may presented by pain if infected
- on examination → rounded, tense cystic mass in midline
 - moves up & down with deglutation (as thyroid swelling)
 - but also moves on protrusion of tongue & swallowing

• Complication :- ① fistula → thin glairy fluid discharge.

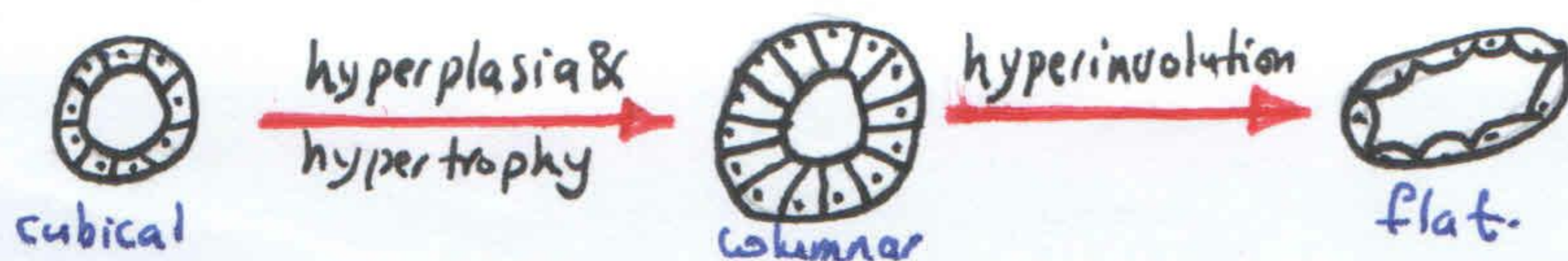
② infection ^{may} → thick viscid fluid or pus.

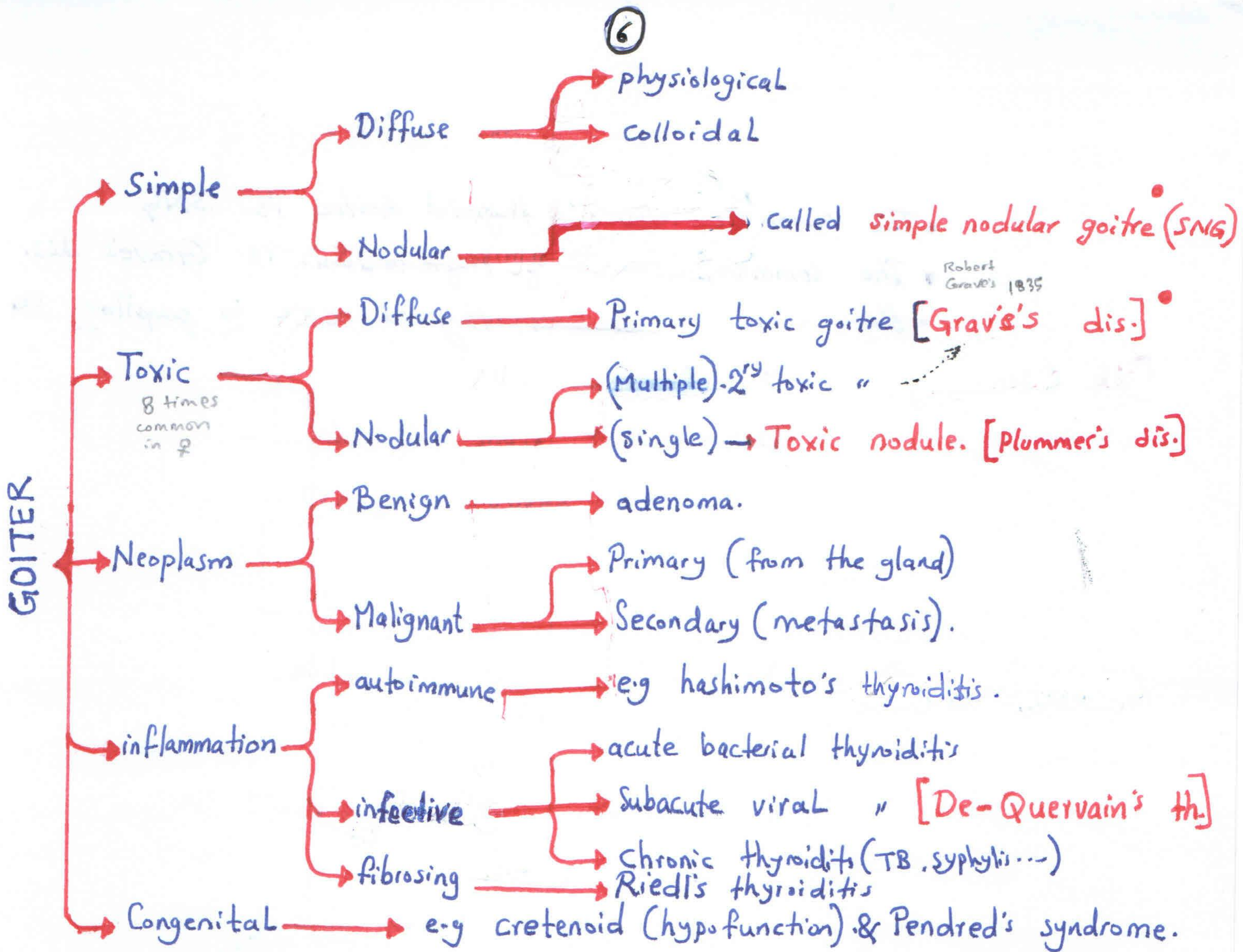
- NB the opening of fistula characteristically indrawn by tongue protrusion.

• Treatment :- [Sistrunk operation] ¹⁹²⁰ = excision of cyst with removal of the track, centre of hyoid bone (to avoid recurrence) and core of tissue up to foramen caecum of tongue.

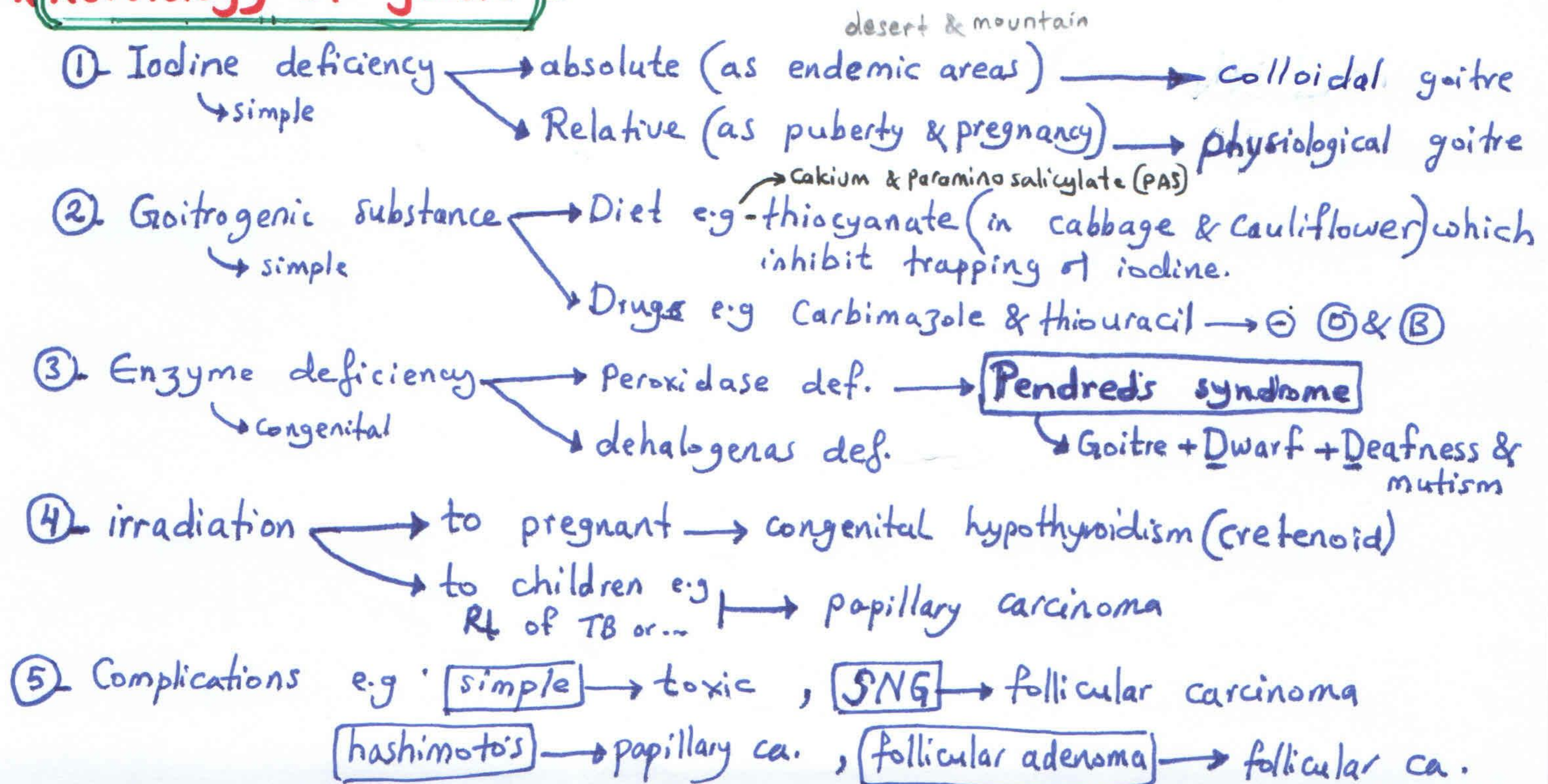
GOITRE

- Goitre means enlargement of thyroid gland.
- The enlargement is due to "hyperplasia" (↑ No. of cells) and also "hyper trophy" (↑ size) of cells lining the follicle where the cells is transformed from cubical to columnar
- If the cells changed into flat cells this is called "hyperinvolution" as in simple colloid goitre.

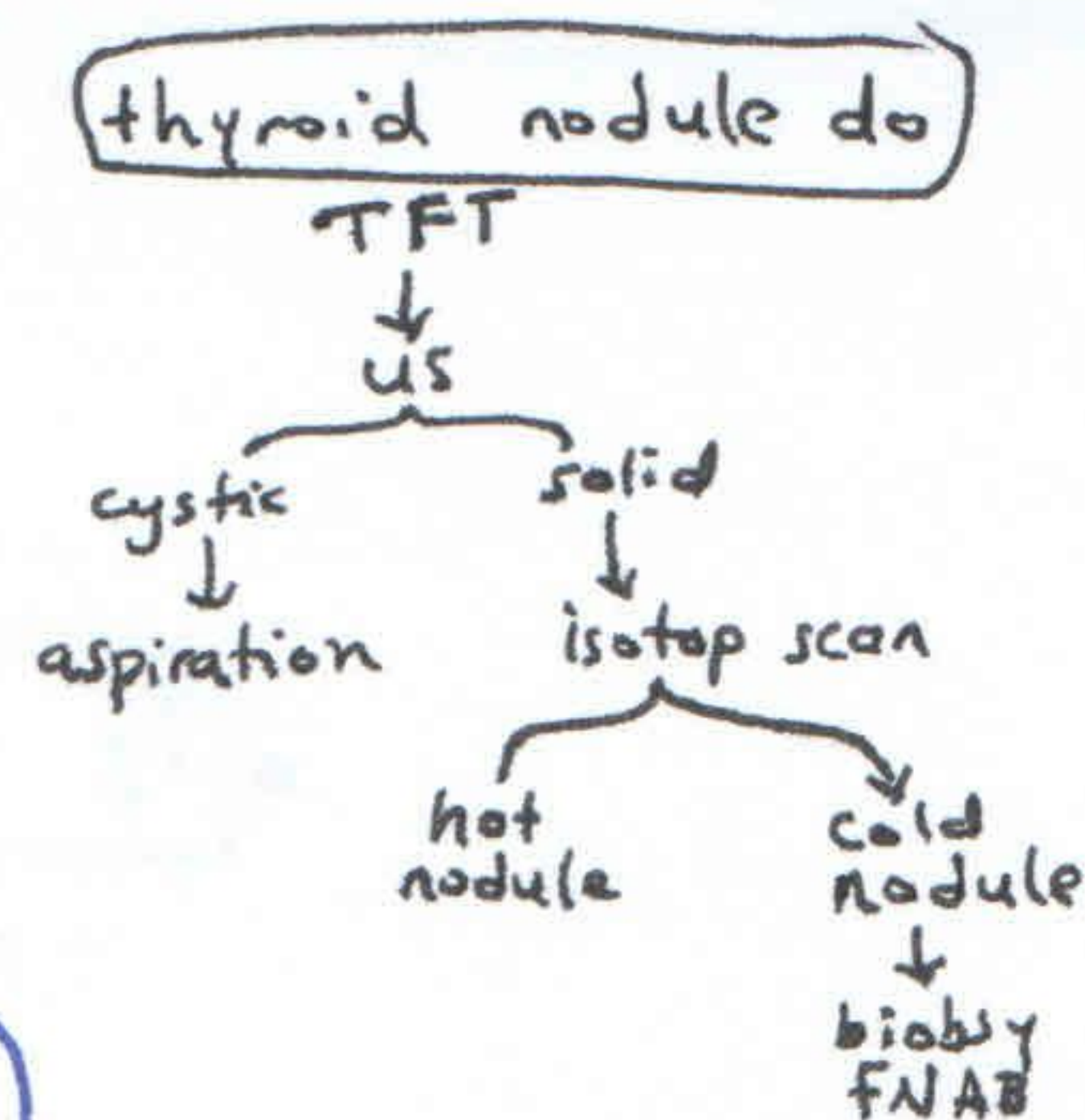




* Aetiology of goitre :



7



Investigation for thyroid dis. :

[A] THYROID FUNCTION TEST : (mainly TSH, T₃, T₄)

- ① in simple goitre (euthyroid) → Normal values of TSH, T₃, T₄.
- ② in toxic " (hyperthyroid) → ↓ TSH, ↑ T₃, T₄
- ③ in hypothyroidism → ↑ TSH, ↓ T₃, T₄
- ④ in Medullary carcinoma → ↑ Calcitonin in blood.
- ⑤ in autoimmune (Grave's, Hashimoto's) → ↑ thyroid antibodies (LATS in Grave's).
- ⑥ Other tests :
 - cholesterol level : ↑ in hypo- & ↓ in hyper thyroidism
 - Glucose level :- hyperglycemia + glucosuria in hyperthyroidism.
 - TRF stimulation test : to exclude hypothalamic lesion (ie ↓ TSH)
 so give TRF → if still ↓ TSH → hyperthyroidism
 if → ↑ TSH → hypothalamic lesion
 - T₃ uptake & suppression test.

[B] RADIOACTIVE STUDY :

- Done by I¹²³ or Technetium Tc⁹⁹ (quicker, low radiation & high resolution image)

- ① Iodine uptake : high (>55%) in hyperth. & Low (<11%) in hypothyroidism.
- ② Thyroid scan : after uptake of I¹²³ or Tc⁹⁹ by gland screen by GAMMA camera

Hot (toxic nodule) or **Cold** (SNG or Malignancy).

Hot → 0% chance malignant (Toronto)
 Cold → 80% only 15% malignant (5% chance) → Toronto

[C] ULTRASOUND U/S :

- Done to distinguish cystic from solid lesions
- If cystic do aspiration
 - Criteria for malignant aspirate
 - Hemorrhagic fluid.
 - Residual mass left.
 - rapid recurrence of fluid.
 - +ve cytology for malignancy.
- If solid do biopsy (FNAC or open biopsy)
 - FNAC is accurate for papillary carcinoma. but can not differentiate bet. follicular "adenoma & adenoca". (capsule invasion in G.)
 - Open biopsy after hemithyroidectomy [or wedge biopsy (not done)].

[D] OTHERS :

- for arrhythmia in hyperthyr. → ECG,
- for Malignancy → tumour markers → calcitonin ↑ in medullary & thyroglobulin ↑ in differentiated ca.
- Detection of metastasis → Lung XR, Liver U/S, Bone scan, Brain CT.

CT for RSG / CXR best

⑧

-(I) SIMPLE GOITRE-

	① Simple physiological goitre (diffuse hyperplastic ")	② simple colloid goitre.
incidence	- Common in young girls "Venus Neck"	- Common in endemic areas.
Aetiology	- relative I_2 deficiency	- Giving large dose I_2 to pt with diffuse hyperplastic goitre
Pathogenesis	- $\uparrow$ TSH $\rightarrow$ hyperplasia & hypertrophy of acini (follicle) so changed from cubical to columnar - Cut section $\rightarrow$ fleshy.	- hyperinvolution - due to sudden removal of cause. - cells changed into flat - Cut section golden brown "colloid"
C/P	- Diffuse enlargement + 3 S (smooth, soft & symmetrical)	- Diffuse enlargement + 3 S (smooth, soft & symmetrical)
fate	- Return to normal or changed into colloidal or SNG	- if untreated $\rightarrow$ SNG
Treatment	- Reassurance + L-thyroxine	- Subtotal thyroidectomy.

③ SIMPLE NODULAR GOITRE :

* **incidence** : - the commonest disease of thyroid gland.
- affects middle age, Female > male.

* **Pathology** - single or multiple nodule (inactive) due to repeated cycles of hyperplasia & involution.

* **Complication** : ① cyst formation :- which may $\rightarrow$ Hemorrhage inside $\rightarrow$ pressure at trachea $\rightarrow$ suffocation. (hard swelling)

② Calcification.

③ Carcinoma (follicular) in 3%.

④ 2nd thyrotoxicosis in 30%.

⑤ Retro sternal extension $\rightarrow$ Retrosternal goitre (RSG).

⑥ Pressure symptoms to $\rightarrow$ Carotid a $\rightarrow$ fainting.

$\rightarrow$ trachea $\rightarrow$ Suffocation or dyspnea

⑦ complication of treatment

$\rightarrow$ tracheomalacia by absorption of tracheal rings

NB Kocker's test : to detect tracheomalacia compress slightly on lateral lobe of gland $\rightarrow$ stridor.
if test +ve $\rightarrow$ tracheomalacia so take consent to permanent tracheostomy

* Clinical picture :-

- Symptoms: slowly enlarged neck swelling or ~~C/P~~ of complication.
e.g pressure symptoms in RSG
- Signs :- (Examination):

(A)- General exam. :- exclude complication (toxicity & malignancy).

(B)- Local exam. :-

- inspection :- usually single mass at muscular Δ of neck that moves up & down with deglutition $\pm$ dilated vein at skin (in Retrost. goitre - RSG) - "s.s.s.s.s.c.e"
- Palpation :- Comment at Site, Size, Shape, Surface, Skin over Edge & Consistency $\pm$ Special size (moves $\bar{e}$ deglutition)
- usually at muscular Δ , nodular with normal skin.
& well defined edge, Firm (hard if clarified, cystic if Hge)
- palpate LN & muscle fixation in case of malignancy.
- Percussion :- on sternum (dull in RSG).
- Auscultation :- (bruit if toxic change)

* Investigation :-

- (A)- to diagnose SNG :- thyroid scan (Cold nodule).
- (B)- to exclude complication :-
- TFT (in toxicity $\uparrow$).
 - Chest X-ray (in RSG & calcification).
 - Biopsy (in malignancy).
 - Neck u/s (in cystic & multinodular).
 - thyroid scan (diagnostic for RSG).

* Treatment :-

- (A)- single nodule $\rightarrow$ hemithyroidectomy (lobectomy + isthmectomy).
- (B)- Multiple nodules $\rightarrow$ Subtotal thyroidectomy (leaving post 1/8 of gland)
to preserve Parathyroid & RLN.
- operation followed by L. thyroxine.
 - Surgery to pt < 25 yr. $\rightarrow$ Recurrence
 - Surgery indicated in SNG if - Bad cosmetic
- Complications (Hge, RSG, Malignancy).
 - pre-op. inderal (in toxic RSG)

(II) TOXIC GOITRE

	① 1 st Toxic goitre.	② 2 nd Toxic goitre	③ Toxic Nodule
-Type-	-Diffuse (exophthalmic) goitre = Grave's (or Basedow) disease	-Multiple nodular goitre (thyro-cardiac goitre)	-Single nodular
-Cause-	-IgG antibodies $\rightarrow$ $\oplus$ TSH receptor [e.g. LATS = LATSP = TSA] - F/H in (50%)	-Complicating SNG. [nodule inactive but internodular tissue active]	-Toxic adenoma (or nodule in multinodular) nodule is active
-Incidence-	-20-30 yr ($\text{♀} > \text{♂}$) (5:1)	-30-50 yr ($\text{♀} > \text{♂}$)	->50 yr ($\text{♀} > \text{♂}$)
-C/p-	-Symptoms:- toxic manifestation mainly metabolic & CNS • Eye signs present. (50%) - Signs:- O/E • diffuse enlargement (soft, smooth, symmetrical) • Mass at same time of toxicity	-toxic manifestation mainly cardiac (CVS) • No eye signs (or v.v. rare) • (firm, nodular, asymm.) • Mass before toxicity.	-Toxic manifestation • (firm, nodular) & asymm.
-ttt (treatment)-	-Medical $\rightarrow$ Main ttt -Surgical $\rightarrow$ • Failure of medical • Recurrence • Hge inside cyst -Radiotherapy $\rightarrow$ • in pt >45 yr.	• as preoperative • Main ttt (subtotal thyroidectomy)	• Main ttt (hemithyroid.) • in pt >45 yr.
	Goitre at same time of hyperthyroidism	Nodule present long time before hyper	

** RARE TYPES of toxic goitre :

- ① Neonatal thyrotoxicosis : new born of thyrotoxic mother.
- ② Factitia thyrotoxicosis : Due to excess intake of L. thyroxine (exogenous)
- ③ Jod-Basedow thyrotoxicosis : Due to large dose of Iodine to hyperplastic gland
- ④ Hashi-toxicosis : as 5% of Hashimoto's thyroiditis in early stage are thyrotoxic
- ⑤ De Curvan's thyroiditis : Due to hormonal release from destroyed tissue.
- ⑥ TSH-secreting adenoma in pituitary gland.
- ⑦ functioning carcinoma.

N.B:- LATS (Long Acting Thyroid Stimulator) = LATSP (LATS Protector) = TSA (Thyroid Stimulator Ab). TSA is used nowadays.

(TSA = Ts Ab)

*CLINICAL PICTURE OF TOXIC GOITRE:

-(A) SYMPTOMS :- (Toxic manifestation) (hyperthyroidism):

- ① Metabolic :- loss of wt inspite good appetite → DD - uncontrolled DM
- Parasitic infestation
- Malabsorption
 - Heat intolerance
 - Excessive sweating
- ② Chest :- - Exertional dyspnoea
- ③ CVS :- - Palpitation (even at rest).
- ④ CNS :- - fine tremors of tongue & hand.
- Irritability, anxiety & insomnia.
- Weakness of proximal limb muscle (myopathy).
- ⑤ GIT :- - Polyphagia, Polydipsia ± diarrhoea.
- ⑥ Urinary :- - Polyuria Due to - Glucosuria • - ↑ BMR
- ↑ renal bd. flow - ↑ water intake
- ⑦ Skeletal :- Generalized bone aches (ie osteoporosis), ^{proximal} myopathy
- ⑧ General :- Diplopia & corneal ulceration.
- ⑨ Gonadal :- impotence in ♂, menstrual disturbance in ♀.

-(B) SIGNS :-

(I) GENERAL EXAM.:

- ① General signs :- - Appearance : normal - Built :- underbuilt.
- Conscious : conscious - Decubitus : orthopnoea.
- Emotion : irritable, alert. - Face :- staring look.
- ② Vital signs :- - Temp. :- ↑ed - RR :- may ↑ed.
- ABP :- ↑systole, ↓diastole - Pulse :- ↑ed

(Pulse = tachycardia, irregular, large volume, equal both sides with water hammer pulse.)

- N.B :- any type of arrhythmia (except heart block) may occur with thyrotoxicosis.
- in thyrotoxic crisis both systole & diastole ↑ed → heart failure.

③ systemic examination :-

①- Head :- flushed face with tongue tremors.

- exophthalmos with eye signs. $\nearrow$ ttt by L: thyroxin $\rightarrow$ $\downarrow$ EPS & may lateral tarsorrhaphy.

eye signs are

① Von Graef's sign (Lid lag).

②- Dabrymple's sign (lid retraction) $\nearrow$ 1-2 mm
N. 5-8/min $\nwarrow$

③- Stellwag's sign (staring look by infrequent blinking)

NB: exophthalmos can be:

false:- due to Lid retraction (contraction of muller's ms bec. of $\uparrow T_3, T_4 \rightarrow \uparrow$ sensitivity to catechol.)

True :- unknow cause but may be due to

- Exophthalmos producing substance $\rightarrow$ (EPS)
- Retroorbital tissue deposition. (mucopolysach.)
- weakness of extraocular ms. $\rightarrow$ diplopia

[2]- Neck :- see local examin.

3- Upper limb → Tremor, warm, sweaty hand, hyperflexia & myopathy.

4. Lower limb → Pretibial myxedema (mucin deposition → yellow patches).
 Re → steroid topical

5. Chest $\rightarrow$ $\uparrow$ Heart sounds - functional murmur at pulmonary area.

6- Abdomen → Liver & spleen enlargement (Reticuloendothelial system enlargement seen in primary toxic goitre).

II - LOCAL EXAM. :-

- mass is soft, smooth, symmetrical in 1st toxic goitre while it is firm, nodular, asymmetrical in 2nd toxic goitre.

NB:- in 1st toxic goitre there is - Pulsation (inspection).

-Thrill (palpation).

- Bruit (auscultation).

NB:- (the most imp. s/s are Goitre, exophthalmos, restlessness & arrhythmia)

* Complication after thyroidectomy :-

- ① Nerve injury : RLN & ELN (see Anatomy of the gland).
- ② Post-operative thyroid crisis (storm) — (see later).
- ③ Hypo-thyroidism • (within 2 days) → post op follow up 4-6 wks
- ④ Hypo-Parathyroidism — manifested by — Tetany within a day. ^{2-4 days post op rarely 2 wks}
 - Typical carpo-pedal spasm.
 - Treated by — slow I.V ca-gluconate 10 cc (10%).
- ⑤ Reactinary hemorrhage :- may manifest as suffocation
 - Treated by immediate wound opening (in bed)
- ⑥ Adherent scar to trachea.
- ⑦ Recurrent hyperthyroidism. → ~~ttt~~ radioiodine (DOI) but child or ^{pregnant} fertile women antithyroid drug (propyl thiouracil) is preferred (not teratogenic)
- ⑧ Increase exophthalmos.
- ⑨ air way obstruction → laryngeal oedema or tracheostomy.
 (10) - cellulitis, keloid, stitch granuloma → rare.

* Thyrotoxic crisis (storm) :-

- Incidence : - Rare nowadays [bec. of good preparation before surgery]
- C/P :- • symptoms :- muscular excitability up to convulsion
 - Signs :- Temp. → malignant hyperthermia.
 - Pulse → irregular, rapid (up to 160/min).
 - ABP → ↑ diastole & systole → heart failure
- Treatment (emergency) :-
 - Ice packs to ↓ pyrexia & paracetamol infusion.
 - Morphine → sedation
 - B-blockers (inderal) → I.V drip in glucose (ē ECG monitor) up to pulse normal.
 - O₂ inhalation & I.V hydrocortisone 25 mg.
 - Antibiotics to prevent infection.
 - Specific ~~ttt~~ — carbimazole 10-20 mg/6hr oral or
 - Lugol's iodine 10 drops/8 hr.
 - Digoxin for uncontrolled atrial fibrillation.
- Mortality :- up to 10%.
- Cause :- unprepared pt before surgery or infection.

* TREATMENT OF TOXIC GOITRE :

= Toxic goitre is treated either medically, surgical or radiotherapy.

	Medical ttt	Radioactive I ₂	Surgical ttt
Indication	1st toxic → all cases. 2nd toxic → as pre-oper. - young & children. - Unfit or refuse surgery - Pregnancy & lactation → best is propylthiouracil in low dose	1st toxic → >45 yr - Solitary toxic → >45 yr - Recurrance after surgery - Unfit for surgery.	1st toxic → if medical failed - recurrance - Huge size 2nd toxic → main ttt - RSG. - Solitary toxic → main ttt - pregnant in 2nd or 3rd trimester
Contraindication	- Solitary toxic nodule (non-hormonal dependent) - RSG (thiouracil → ↑ size)	- young & children (risk of cancer). - Iodine allergy. - Pregnancy & Lactation (cretinoid goitre) ↓ bec. teratogenic & carcinogenic	surgery not advised in young pt due to high recurrance
Line of treatment	① Mental & physical rest. ② Sedatives & tranquilizers. ③ β-blockers e.g. ● Propranolol (inderal) - action • inhibit peripheral conversion of T₄ → T₃ • block adr. action. - Dose • 10-40 mg/8hr. oral ④ Antithyroid drugs e.g. ● Carbimazole (neomercazole). ● Propyl thiouracil. ● K-Perchlorate. ⑤ Methimazole (MMI) best now for ttt toxic goitre ↳ safe in pregnancy.	- I¹³¹ :- - action: destruction of thyroid cells by β-particles. → sublethal damage. - Dose 1. 160 μCi/1g (microcuris)/1g - onset :- 2-5 months (if no action >3m repeat dose.) - S/E :- - Myxoedema - Leukaemia - thyroid ca. * Myxoedema seen in 80% of pt after 10 years	- Pre-operative :- ● Carbimazole (2-3 month) till pt euthyroid ● Propranolol :- 40mg/8hr 1 week before & 1 week after surgery - Operation :- - Subtotal thyroidectomy - post-operative • indirect laryngoscope before discharge • Serum Ca⁺⁺ after 6 wk • " T₃.T₄ every 6 m.

ENT consult before surgery (medicolegal) for fiberoptic laryngoscopy (mobility of vocal cord).

* Antithyroid drugs :-

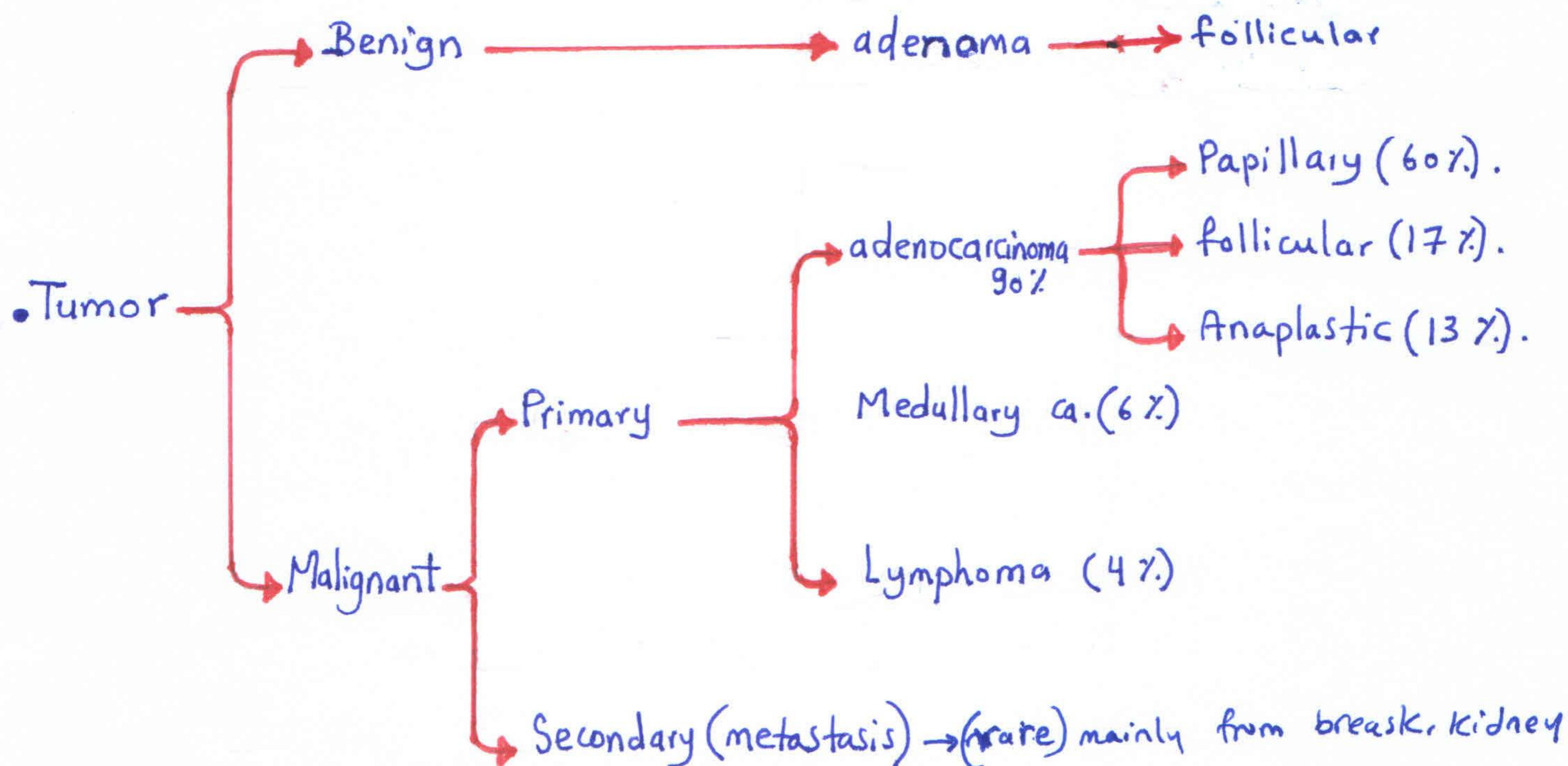
	Carbimazole	Thiouracil	Perchlorate
action	• inhibit oxidation & Binding	• inhibit ① & ② • ↓ conversion T ₄ → T ₃	• inhibit trapping ①
Dose	- 10 mg/8h oral till euthyroid then 5 mg/8h 1-1.5 yr • onset 7-14 day	- 100 mg/8h oral till euthyroid then 50 mg/day	- 200-300 mg/8h
S/E	- Aplastic anemia - Agranulocytosis	- Bone marrow depress - GIT disturbance - Joint pain	rare. S/E very safe & can given to children

* other complication of the antithyroid drugs :

- ① allergy :- skin rash, itching
- ② Myxoedema (over dose)
- ③ - Cretinoid (in lactation)
- ④ ↑ vascularity → ↑ HR (A-V shunt) → mislead to hyperthyroidism → ↑ dose → myxoedema

(III) - TUMORS -

■ The tumors of thyroid gland may be benign or malignant.



* **ADENOMA** :

- ① **Follicular adenoma** :-
- presents as a solitary nodule
 - Complicated to follicular carcinoma (capsule invasion).
 - Treated by hemithyroidectomy.

histological types of follicular adenoma

- ① Embryonal type : acini without lumen 
- ② Foetal type : acini with empty lumen 
- ③ Micro-follicular type :- acini with little colloid in lumen 
- ④ Macro- " " :- " " Normal " " " 
- ⑤ Hurthle-Cell type :- acini with granular acidophilic cytoplasm 

NB Papillary tumours considered as malignant even capsulated and behave like papillary carcinoma

* ADENOCARCINOMA (90%)

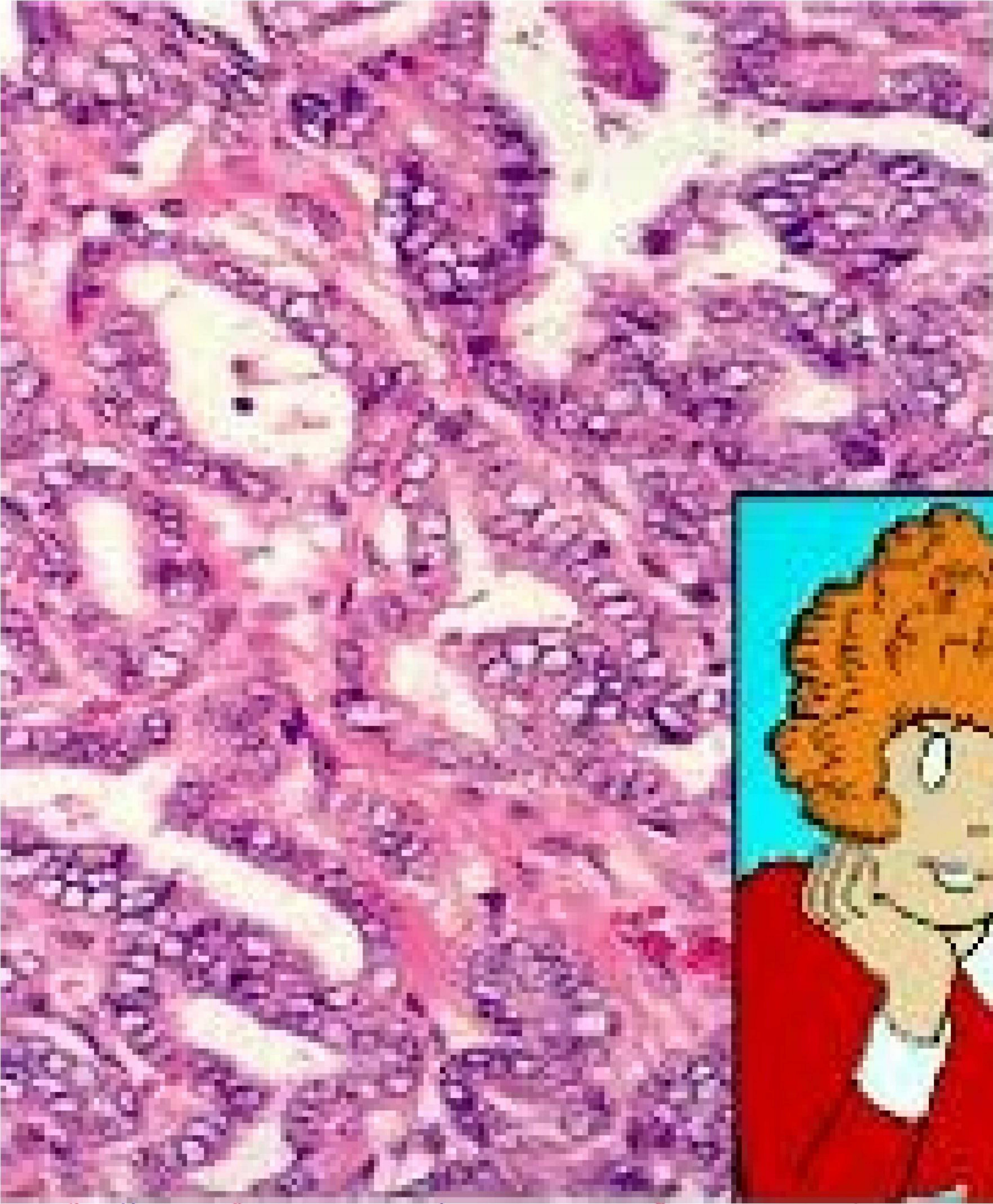
	Papillary	follicular	anaplastic
Incidence	60%	17%	13%
Sex	♀ > ♂ 3:1	♀ > ♂ 2:1	♀ > ♂
Differentiation	Differentiated	Differentiated	Undifferentiated
Age	children & young adult 30-40 yrs	middle age 40-50 yr	Elderly. ^{commonly} 65 yr
prognosis	The Best ^{10 yrs survival is 90%}	Less favorable	very poor
Mortality	11%	24% (twice)	Die within 1-2 yr.
Spread	Lymphatic (mainly)	Blood (mainly)	Direct (mainly)
Multiplicity	multifocal (due to the intrathyroid lymph spread)	-ve	-ve
Behaviour	• Hormon dependence + • I₂ uptake - • radiation response -	- + -	- - +
predisposing factors	- radiation to neck - Hashimoto's thyroiditis	- follicular adenoma - SNG	- De Novo
pathology	<u>N/E</u> . Localized slowly growing <u>Micro</u> - ^{often} cystic lesion with papillary projections - Psammoma bodies (calcified foci) - Orphan Annie nuclei	- ill-defined, irregular - follicles with variable differentiation degree - capsular & vessel invasion - high in endemic areas	- large - rapid growing - clusters of spindle cells with giant cells - Local infiltration & fibrous tissue bet. cells

↳ Hurthle cell tumour is variant of follicular.

↳ ttt radiotherapy in all cases

* MEDULLARY CA. : (6%)

- Origin: from para follicular 'C' cells → secreting calcitonin. (80% unit)
- Types $\left\{ \begin{array}{l} \text{sporadic} \rightarrow \text{Better prognosis (75\%)} \\ \text{familial} \rightarrow \text{worse, multicentric, young age, hypercalcemia \& may associated with MEN type IIa \& IIb} \end{array} \right.$ 25%
- C/P → Diarrhoea (in 30% of pt) [due to 5HT or ↑ PG₂] (50-60 yr old) ^{no sex predominance}
- Treatment → Total thyroidectomy + selective neck LN dissection.
- investigation → ↑ calcitonin in blood [tumor marker]. CEA. ^{± Radioth. \& T4}
- Spread → mainly lymphatic (50-60% have LN) [not TSH dependent]



(17)

in medullary ca. there is a characteristic amyloid stroma.

* LYMPHOMA: (4%)

- Origin:- from lymphoid tissue of the gland.
 - may be predisposed by Hashimoto's thyroiditis.
- Treatment:- Radiotherapy [& chemotherapy . if +ve LN] good prognosis

NB: 2-4% of medullary ca pt develop cushing due to ectopic ACTH release.

* Predisposing factors for Cancer :

- ① Irradiation to neck → papillary ca.
- ② Hashimoto's thyroiditis → papillary ca. & lymphoma.
- ③ Follicular adenoma → follicular ca.
- ④ Simple nodular goitre (SNG) → follicular ca.
- ⑤ De Novo (new) → Anaplastic ca.

* C/P of Carcinoma :

* **Symptoms** : - usually in >50 years age .

- rapid ↑ size in short duration & may presents by pain which may referred to ear [through auricular br. of vagus (Arnold nerve)] .

- symptoms of malignancy (metastasis) → [Liver, Lung, Bone & Brain]

- symptoms of local infiltration:-

- Trachea → dyspnea
- esophagus → dysphagia
- Carotid a → fainting
- IJV → face oedema

• RLN → hoarseness or stridor

• symp. chain → Horner's syndrome

- ① ptosis
- ② myosis
- ③ Anhydrosis
- ④ Enophthalmos.

- may present only by LN in neck "Occult ca" = papillary ca.

* **Signs** : (A) General: metastasis as bony swelling, LNs enlargement.

(B) Local:- Tender, Hard, Irrregular, Enlarged & Fixed mass

- Berry's sign (absent carotid pulsation)

- The thyroid cancer may presents a typically in cases of
- ① occult carcinoma (ie only metastatic presentation)
 - ② hyperthyroidism (if functional cancer).
 - ③ histological surprise :- discover malignancy after removal benign lesion e.g SNG or follicular adenoma

* Staging :-

• TNM staging

• DeGroot staging

Stage I = T_1 . No . Mo

Stage II = T_2 . No . Mo (or T_3 No . Mo)

Stage III = T_3 . No . Mo (or any T . N₁ . Mo)

Stage IV = Any T . any N . M₁ →

IV A (T_4 or T_3 or T_2) / N_{1b} / Mo

IV B any T . No . M₁

IV C any T . N₁ . M₁

Tumor	Node
T_0 = no 1 st tumor	No → -ve
T_1 = ≤ 2 cm	N ₁ → +ve
T_2 = 2-4 cm	
T_3 = > 4 cm	
T_4 = extra thyroid	
	Metastasis
	Mo → -ve
	M ₁ → +ve

* Investigation :

- ① Diagnostic procedures :-
- Radioactive I¹²³ scan → cold nodule
 - U/S → Cystic (as papillary ca) or solid
 - FNAC → if cystic
 - Biopsy

② Diagnosis of metastasis :- Lung X-ray, Liver u/s, Bone scan, Brain CT/MRI.

③ Diagnosis of infiltration :- Laryngoscopy (RLN), Bronchoscopy (trachea), Oesophoscopy.

④ Tumor markers :- ↑ serum calcitonin (medullary), ↑ thyroglobulin (differentiated ca).

N₁ { N_{1a} = ipsil. LN
N_{1b} = bilateral or contral.

* Treatment :

operable cases	in-operable cases
• papillary & follicular ca. • Medullary ca. • anaplastic ca. (in early stage)	• papillary & follicular ca invading vital organs. • anaplastic ca. • Unfit for surgery. • pt ē metastasis

ttt of operable	ttt of inoperable
• operative: total thyroidectomy ē selective DR block LN dissection • post-op: - L. thyroxine. 0.1-0.2 mg/d. - follow up every 6 months for examin. tumour marker & thyroid scan.	• palliative - isthmectomy - tracheostomy - Gastrostomy - Pain Killer. • L. thyroxine → papillary • I₂ uptake → follicular • Radiation → anaplastic

De Groot staging

- I - limited to thyroid
- II - LN involvement
- III - extrathyroid.
- IV - distant metast

(IV) THYROIDITIS

(A) INFLAMMATORY:

(Granulomatous)

(De Quervain's)

	① Acute bacterial thyroiditis :-	② Subacute viral thyroiditis
Cause	after bacterial infection nearby.	- viral infection. → Painful
C/P	- Acute onset of severe neck pain, fever & Chills.	- Insidious onset, swollen, firm, tender gland & fever (No chills).
invest.	if pus formed → culture.	- ↑ ESR, ↓ TLC (total leucocyte count) ↑ T ₄ , ↓ I ₂ uptake
ttt.	Antibiotic (+ abscess drain)	- Prednisolone orally (it is self limiting)

(B) AUTOIMMUNE: [Hashimoto's thyroiditis] (chronic lymphocytic thyroiditis)

- Cause: - autoimmune, in middle aged female. (20:1) age (30-50 yr)
- C/P: - insidious onset, swollen, firm gland. mild hyperthyroidism 5%
- invest: - ↑ thyroid Ab (biopsy for DD of carcinoma), ↑ TSH
- Treatment: - Subtotal thyroidectomy if enlarged & pressure symptoms
- Replacement therapy by L. thyroxine.
- Complications: - may complicated by ^{20%} hypothyroidism or carcinoma (papillary ca. or Lymphoma... may associated & Down & Turner syndrome)

(C) FIBROSING: [Riedel's thyroiditis] [woody thyroiditis]

- Cause: - Collagen disease (0.5% autoimmune cause). female (30-50 yr)
- C/P: - hard (woody) gland due to fibrosis (with infiltration to surrounding)
- invest: - Biopsy to DD from anaplastic ca.
- Treatment: - Palliative isthmectomy.
- Replacement therapy by L. thyroxine.
- Complications: may complicated by hypothyroidism.

NB: Hashimoto's has Ab called Antithyroid peroxidase (TPO) which acts as thiouracil → hypothyroidism

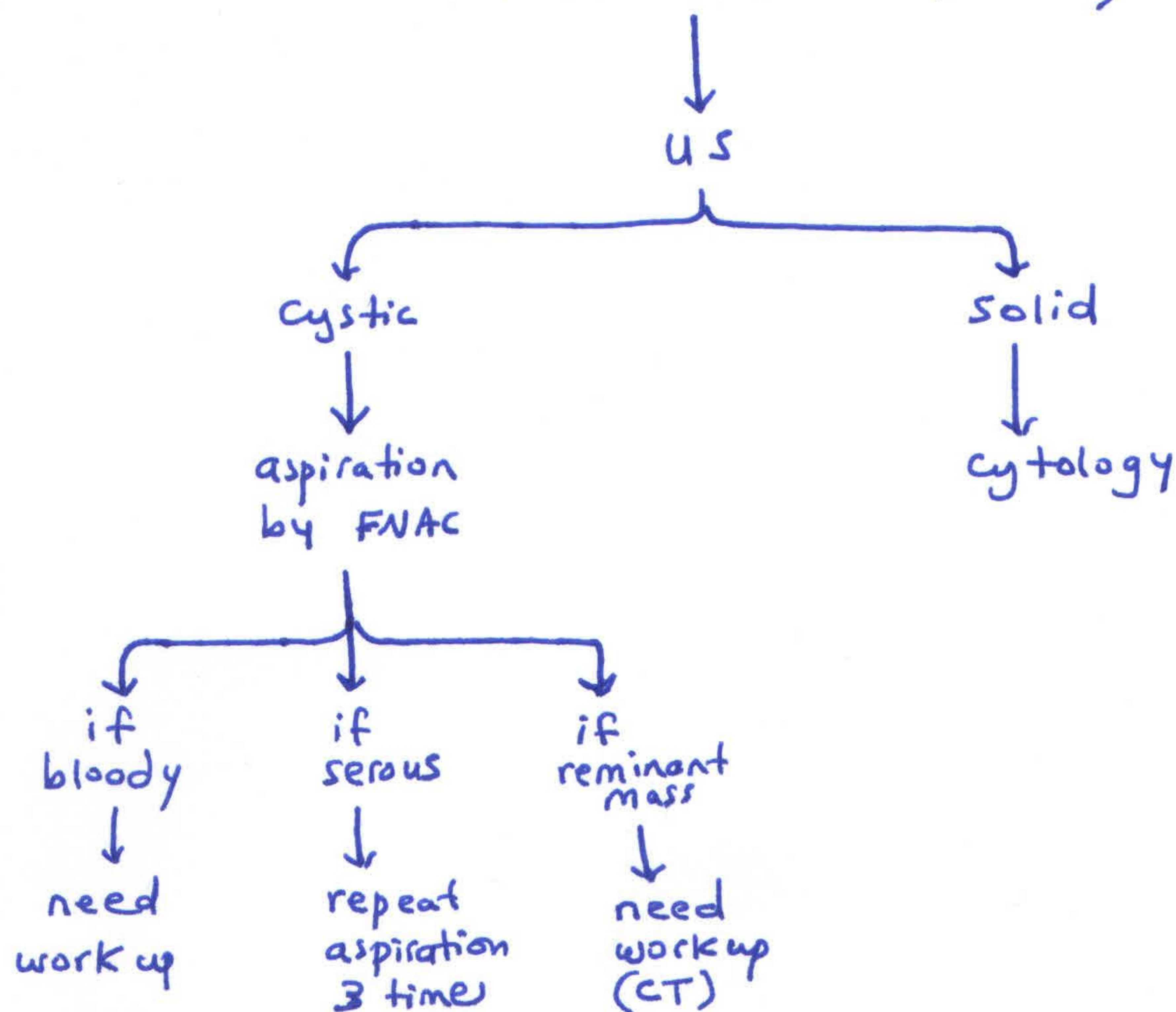
- Hashimoto's presents as multinodular goitre, there is a feature of chronic lymphocytic thyroiditis on histology.

NOTES :-

- Disadvantages of antithyroid drugs are:-
 - prolonged ttt.
 - failure rate after 2 years is 50%
 - ↑ goitre & more vascularity in some pt.
- production of thyroid hormones can be blocked by:-
 - propylthiouracil.
 - methimazole.
 - carbimazole
 - iodine (Wolff-Chaikoff effect)
- Papillary carcinoma has a tendency to change into ~~pap~~ anaplastic type & it becomes more malignant with age.
- lateral aberrant thyroid is a term that implies a metastasis in cervical LN from occult cancer.
 - Daily requirement of iodine is 100-125 µg.
 - ↑ iodide supply inhibits iodide organification (Wolff-Chaikoff effect) → ↓ T₃, T₄ synthesis
- NB:- bec. of high recurrence of multinodular goitre some advice total thyroidectomy. E-6
- NB:- history in thyroid ca. ask about age, H/o radiation, endemic area, F/H (medullary ca), rapid growth, pain, compression symptoms, s/s of metastasis (LLBB) & past H/o surgery.
- NB:- in MEN IIa phaeochrom. ^{treated} ttt first (bec. this pt has malignant HTN interfere w surgery & anaesth) before ttt medullary ca.
 - papillary ca. good prognosis, total thyroidectomy bec. it is multifocal

NB:- investigations of thyroid disease
(T₃, T₄, TSH, antithyroglobulin)

د/العزيزي



- Cut biopsy or needle biopsy now not used due to risk of hemorrhage, nerve injury.
- most common nerve injured postop. is external laryngeal nerve.
- most common cause of hoarseness of voice is over use of voice.
- Parathyroid gland is like fat so to be sure that you remove it put it in water if it is floating → adipose tissue, if sinking → parathyroid then send for cytology.

Parathyroid Glands

* HYPERPATHYROIDISM :

* Aetiology :-

- ① 1st hyper-parath. :- Due to adenoma (commonest type - 80%).
- ② 2nd " " :- Due to hypocalcemia (e.g CRF, malabs.) $\rightarrow$ 2nd hyperplasia.
- ③ Tertiary " " :- Due to prolonged stimulation by hypocalcemia leading to autonomy (hormon independent) $\rightarrow$ $\uparrow$ ^{PTH} hormone

* Clinical picture :- (Bones, stones, abdomen & psychic moans):

- ① Bone :- generalized decalcification $\rightarrow$ osteitis fibrosa cystica (bone cysts) $\rightarrow$ path.
- ② Renal stones :- recurrent stones & nephrocalcinosis (due to hypercalcaemia & ^{phosphaturia})
- ③ Abdomen :- Peptic ulcers & acute pancreatitis (due to hypercalcaemia).
- ④ Psychic moans :- ($\text{♀} > \text{♂}$), Restlessness, irritable, change personality, neurosis

* investigation :-

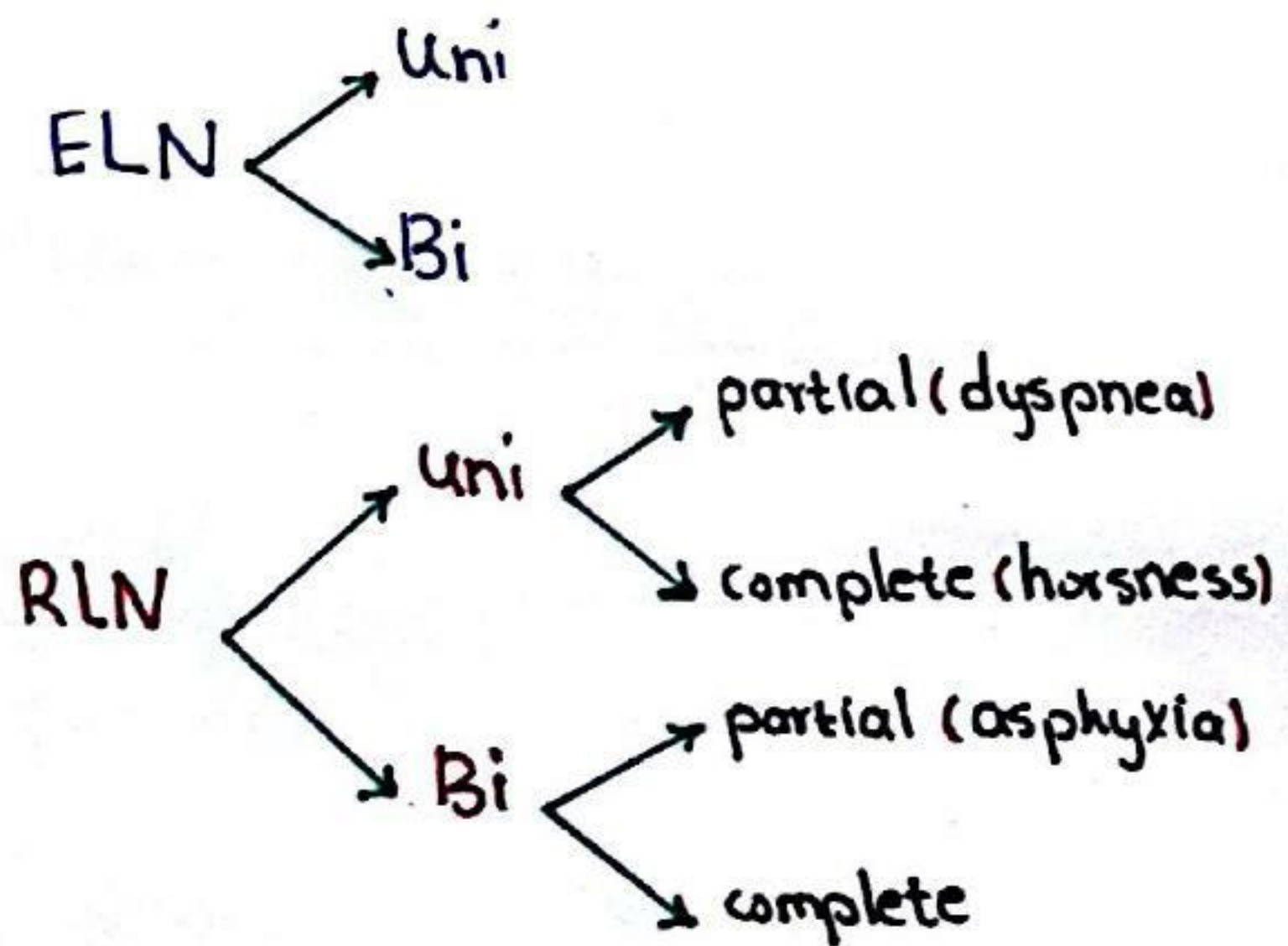
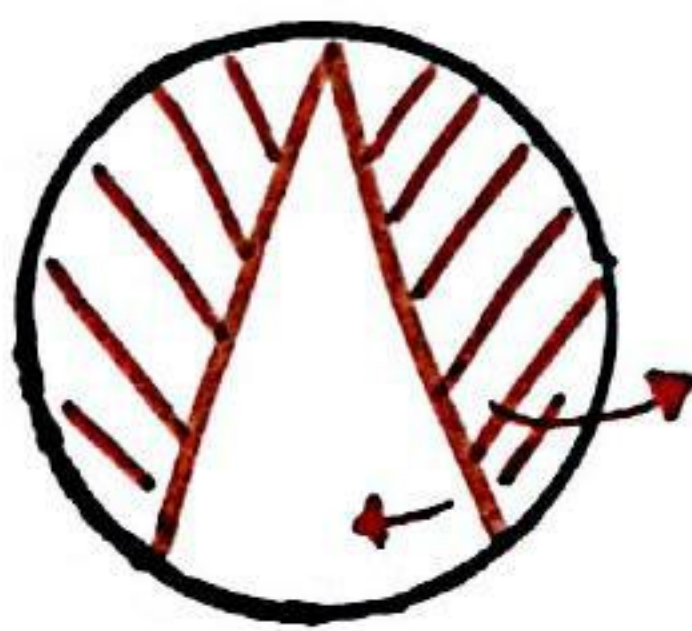
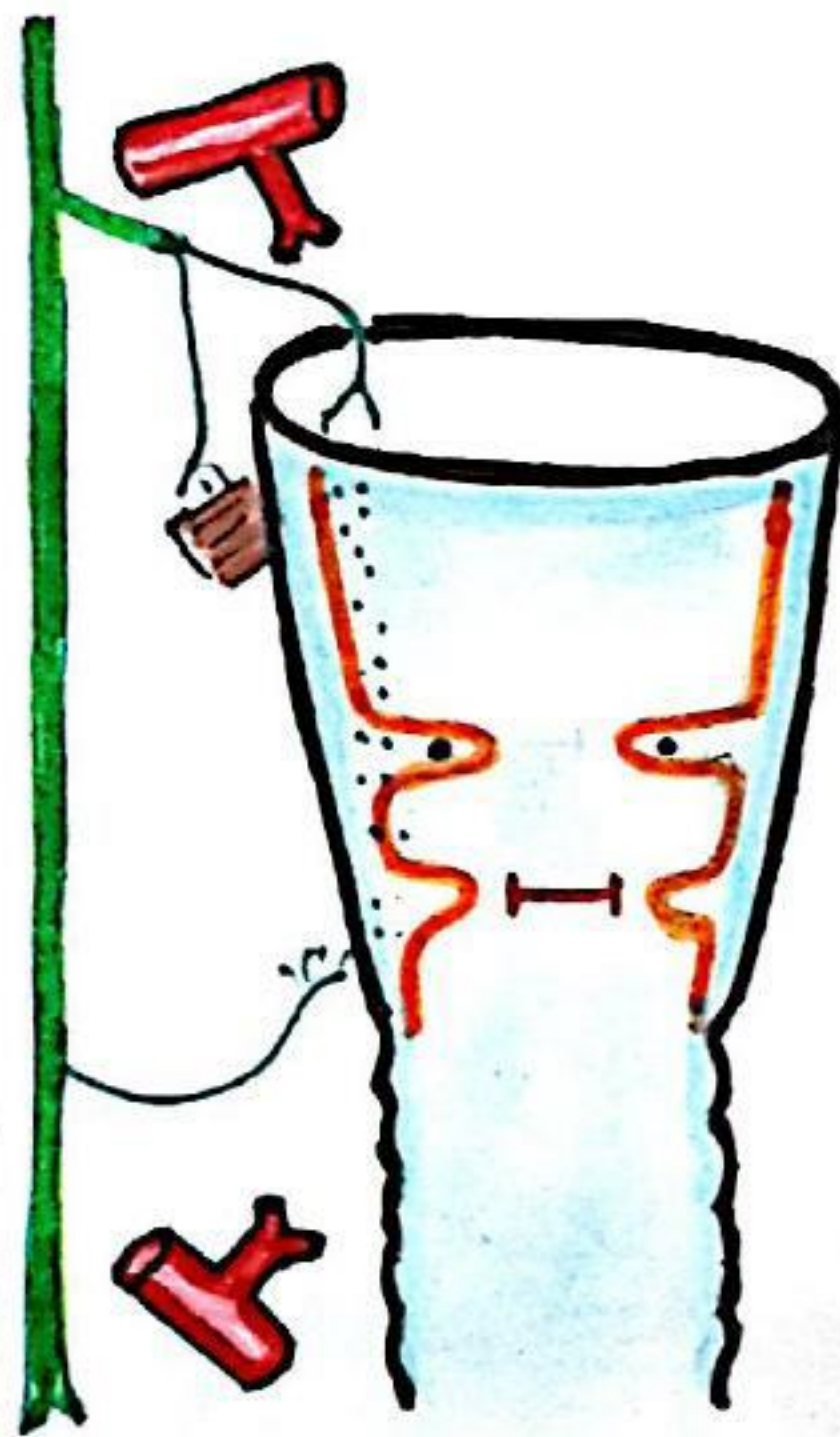
- Blood $\rightarrow \uparrow \text{Ca}^{++}$, $\downarrow \text{PO}_4$ & $\uparrow \text{PTH}$.
- Urine $\rightarrow \uparrow \text{Ca}^{++}$, $\uparrow \text{PO}_4$
- X-ray $\rightarrow$ multiple bone cysts
- Localize the gland by - u/s, CT scan or (Thallium²⁰¹ Tc⁹⁹ subtraction scan)

* Treatment :- ① parathyroid adenoma $\rightarrow$ resection of adenoma.

- ② Parathyroid hyperplasia $\rightarrow$ resect 4 glands & implant part of one in sternomastoid (easier for re-exploration if needed)

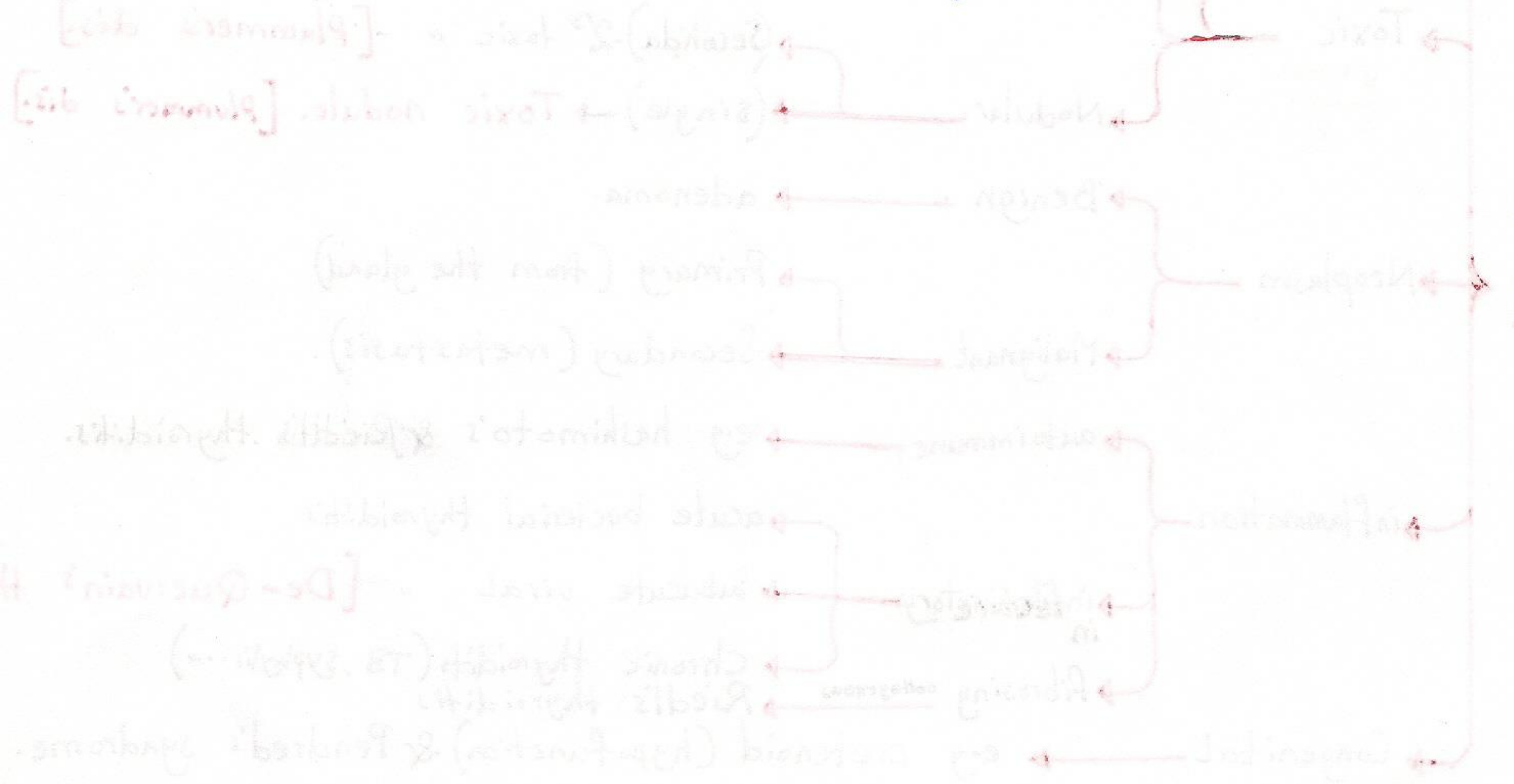
Thallium²⁰¹ - Tc⁹⁹ subtraction scan :-

Both substance are given, Tc⁹⁹ is taken [only by thyroid gland] while thallium [by thyroid & parathyroid], by computerized subtraction of the two captured images the parathyroids appears as hot spots

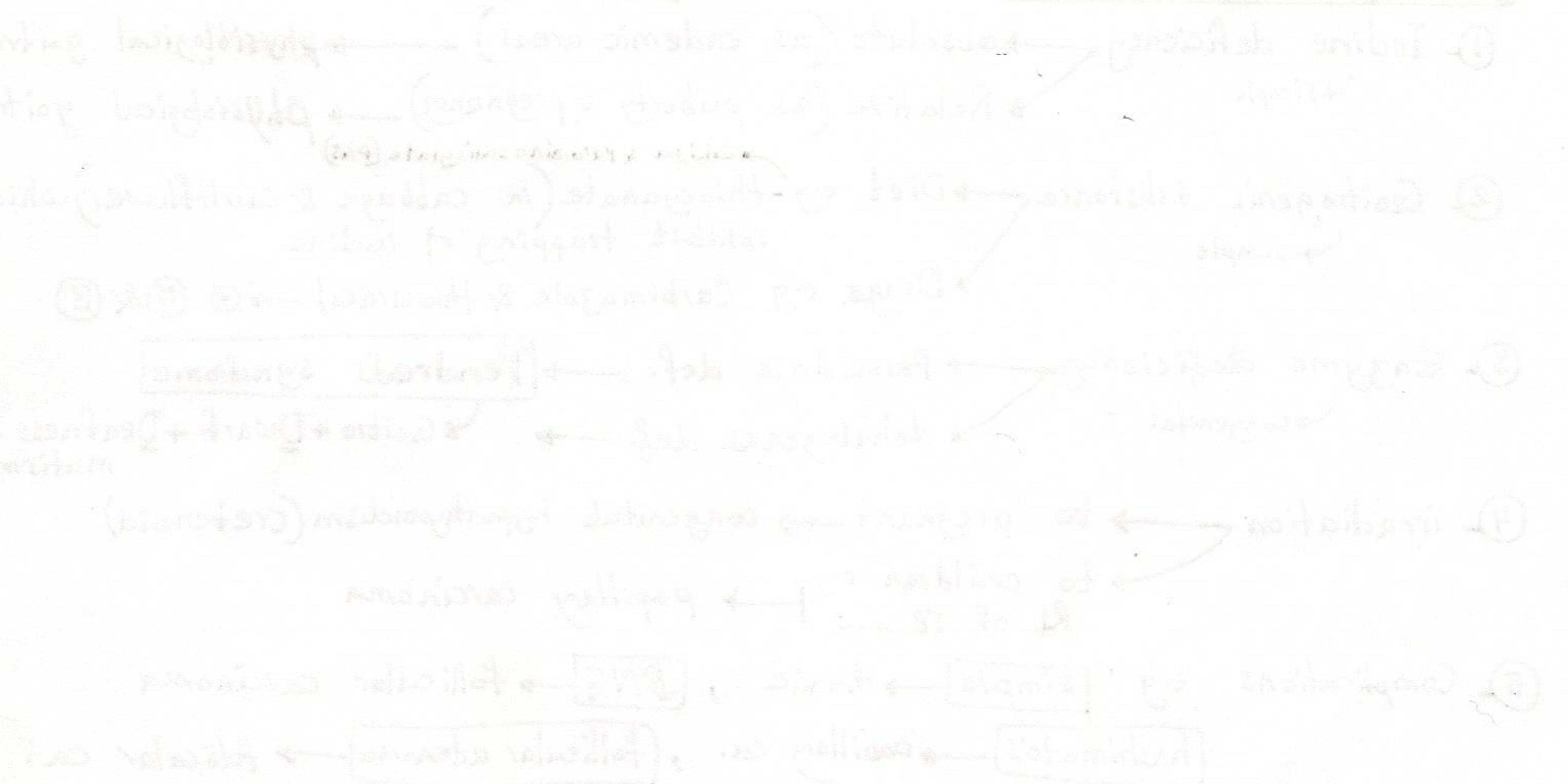


- The commonest dis. of thyroid Goutre is SNG
- The commonest cause of thyrotoxicosis is Grave's dis.
- The " ————— thyroid cause is papillary ca.

causes



Pathology of goitre



NOTES :-

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 - propylthiouracil.
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- NB:- in MEN IIa phaeochrom. ^{treated} ttt first (bec. this pt has malignant HTN interfere w surgery & anaesth) before ttt medullary ca.
 - papillary ca. good prognosis, total thyroidectomy bec. it is multifocal

• T₃ uptake test:-

- radioactive T₃ incubated w pt serum → T₃ bind to free TBG → estimate No. of free binding sites.
- May be — low (in thyrotoxicosis)
- high (in hypothyroidism)

• T₃ suppression test (if I¹²³ uptake is high)

- Normally I¹²³ uptake is suppressed by given T₃ for 7 days
- in thyrotoxicosis T₃ has no effect.

* Diagnostic criteria for factitia thyrotoxicosis are :

① $T_4 : T_3 \approx 70 : 1$ (in hyperthyroidism $30 : 1$) (normal $4 : 1$)

② marked $\downarrow\downarrow\downarrow$ iodine uptake

③ marked $\downarrow\downarrow\downarrow$ serum thyroglobulin

CLINICAL PICTURE OF TOXIC DIARRHEA

- Diplopia due to exophthalmus & weakness of eye ms.
- **Glycogenolysis** is $\uparrow$ in liver, $\uparrow$ insulin breakdown &
 $\uparrow$ Glucose absorption in gut.
• this will unmask DM or make control of DM difficult
- **Lipolysis** $\rightarrow$ $\downarrow$ cholesterol ($\uparrow$ in myxoedema)
 $\rightarrow$ breakdown of fat $\rightarrow$ free Fatty acid $\xrightarrow{\text{oxidation}}$ $\uparrow$ heat

CLINICAL SIGNS

GENERAL EXAM:

- General signs:
 - Appearance: normal
 - Consciousness: conscious
 - Emotions: irritable, alert
- Vital signs:
 - Temp: $\uparrow$ (fever)
 - HR: $\uparrow$ (tachycardia)
 - RR: $\uparrow$ (tachypnea)
 - BP: $\uparrow$ (hypertension)
- Other signs:
 - Weight: $\downarrow$ (weight loss)
 - Gait: unsteady
 - Eyes: staring look
 - Bowel: constipation

Many type of antibodies (except heart block) may occur with thyrotoxicosis.
In thyrotoxic crisis both systolic & diastolic $\uparrow$ - marked failure

• Eye signs :- (4) Joffroy's sign :- loss of wrinkling of forehead on looking upward

(5) Mobius sign :- lack of convergence on looking at near object

• **Myxoedema** - is the dis. of hypothyroidism (due to $\downarrow T_3, T_4 \rightarrow \uparrow TSH$)

symptoms $\rightarrow$ Cold, $\uparrow$ wt, anemia & constipation

signs $\rightarrow$ hyporeflexia, husky voice

skin puffiness (due to $\uparrow$ hyaluronic acid in tissue)

Complication $\rightarrow$ myxoedema coma

there is severe hypothermia, very weak,

hypoglycemia, water retention, confusion, hypoventilation

• Myxedema in 80% after 10 years.

— onset of carbimazole is 7-14 days because the already formed T_3 & T_4 not affected

(half life of T_3 ^(18 hr) one day & T_4 one week)

— in pregnancy dose of antithyroid drugs the same & may lead as $\uparrow$ TBG $\rightarrow$ $\downarrow$ ^{serum} free thyroid hormone.

Antithyroid drugs	Carbimazole	Propylthiouracil
① Antithyroid drug ② Carbimazole (thioimide) ③ Propylthiouracil ④ K-perchlorate	① Inhibits oxidation of T_4 to T_3 ② Inhibits release of T_4 from thyroid follicles ③ Inhibits synthesis of thyroid hormone	① Inhibits oxidation of T_4 to T_3 ② Inhibits release of T_4 from thyroid follicles ③ Inhibits synthesis of thyroid hormone ④ Inhibits conversion of T_4 to T_3
Dose: 10-15 mg/day	Dose: 10-15 mg/day	Dose: 10-15 mg/day
Onset: 7-14 days	Onset: 7-14 days	Onset: 7-14 days
Half-life: 10-12 hrs	Half-life: 10-12 hrs	Half-life: 10-12 hrs

- Antithyroid drugs
- ① Carbimazole (thioimide)
 - ② Propylthiouracil
 - ③ K-perchlorate
 - ④ Methylthiouracil
 - ⑤ Thiocarbonyl
 - ⑥ Thiocarbonyl
 - ⑦ Thiocarbonyl
 - ⑧ Thiocarbonyl
 - ⑨ Thiocarbonyl
 - ⑩ Thiocarbonyl

Antithyroid drugs	Carbimazole	Propylthiouracil
① Carbimazole (thioimide)	① Carbimazole (thioimide)	① Carbimazole (thioimide)
② Propylthiouracil	② Propylthiouracil	② Propylthiouracil
③ K-perchlorate	③ K-perchlorate	③ K-perchlorate
④ Methylthiouracil	④ Methylthiouracil	④ Methylthiouracil
⑤ Thiocarbonyl	⑤ Thiocarbonyl	⑤ Thiocarbonyl
⑥ Thiocarbonyl	⑥ Thiocarbonyl	⑥ Thiocarbonyl
⑦ Thiocarbonyl	⑦ Thiocarbonyl	⑦ Thiocarbonyl
⑧ Thiocarbonyl	⑧ Thiocarbonyl	⑧ Thiocarbonyl
⑨ Thiocarbonyl	⑨ Thiocarbonyl	⑨ Thiocarbonyl
⑩ Thiocarbonyl	⑩ Thiocarbonyl	⑩ Thiocarbonyl

• Berry's lig = - thick elastic bundle bet. thyroid cart. (sup. horn)

and hyoid bone (tip of greater horn)

- forms post. border of thyrohyoid membrane

- called lat. thyrohyoid lig.

*Predisposing factors for Cancer:

- ① Irradiation to neck -> papillary ca.
- ② Hashimoto's thyroiditis -> papillary ca. & lymphoma
- ③ Follicular adenoma -> follicular ca.
- ④ Simple nodular goitre (2nd) -> follicular ca.
- ⑤ De Novo (neoplasms) -> papillary ca.

*Signs of Carcinoma:

*Symptoms: usually in > 50 years age.
- rapid ↑ size in short duration & may present
- pain which may refer to ear [through
- anterior br. of vagus (Glossopharyngeal nerve)].

- symptoms of metastasis (metastases) -> [Liver, lung, Bone & Brain]

*Symptoms of local infiltration:
- Hoarseness or stridor
- Dysphagia -> difficulty in swallowing
- Cough -> due to irritation of larynx
- Pain in neck
- Enlarged lymph nodes

- may present only by LN in neck "occult carcinoma"

- *Signs:
- (A) General: metastases as bone swelling, Lm enlargement
 - (B) Local: - Tender, Hard, Irregular, Enlarged & Fixed mass
 - Bright's sign (absent carotid pulsation)

hypercalcemia $\rightarrow$ $\uparrow$ gastric & pancreatic secretions.

- **PTH** - half life only 2-3 min.

- storage in cells is sufficient only $\approx$ 1 hr.

- **PTH effect** ① Bone - resorption

② Gut - $\uparrow$ Ca^{++} absorption by $\oplus$ of vit D synthesis in kidney.

③ Kidney - $\uparrow$ Ca^{++} resorption in distal tubule.

- $\uparrow$ PO_4 excretion in proximal tubule.

- $\downarrow$ HCO_3 resorption in renal tubule $\rightarrow$ acidosis $\rightarrow$ $\uparrow$ Ca^{++} ionization.

- **PTH** $\rightarrow$ hypercalcemia.
hypophosphatemia.
hyperchloremic acidosis.

MEN I

- parathyroid adenoma $\rightarrow$
- pituitary tumor
- pancreatic tumor
- adrenal tumor & Carcinoid

MEN II α

- parathyroid hyperplasia
- pheochromocytosis
- Medullary ca.

MEN II β

- pheochromocytosis
- Medullary ca.
- Marfanoid.
- Mucosal adenoma.

MEN II = Sipple's syndrome